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NORTON SOUND

FINAL ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL & GAS LEASE SALE 57

ALASKA OUTER CONTINENTAL SHELF OFFICE

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UNITED STATES
DEPARTMENT OF THE INTERIOR

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FEBRUARY 1982

Proposed
Outer Continental Shelf
Oil and Gas Lease Sale
Norton Sound

Prepared by
BUREAU OF LAND MANAGEMENT

Director, Bureau of Land Management

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FINAL ENVIRONMENTAL IMPACT STATEMENT
Proposed Outer Continental Shelf
Oil and Gas Lease Sale
Norton Sound

Summary Sheet

( ) Draft (X) Final

U.S. Department of the Interior, Bureau of Land Management, Alaska OCS Office, P.O. Box 1159, Anchorage, Alaska 99510.

1. Type of Action: Proposed Oil and Gas Lease Sale, Norton Sound.

(X) Administrative ( ) Legislative

2. Description of the Action: The leasing proposal consists of a total of 988,416 hectares (2.4 million acres) of OCS lands. The 429 blocks are located in Norton Sound 14.4 to 99.2 kilometers (9 to 62 mi) offshore in waters that are from 5 to 27 meters (16 to 89 ft) deep. If implemented, this sale is tentatively scheduled to be held in November 1982.

3. Environmental Impacts: All blocks offered pose some pollution risk to the environment. The risk potential is related to adverse effects on the environment and other resource uses which may result principally from accidental or chronic oilspills. Socioeconomic effects from onshore development will have state, regional, and local implications.

Several alternatives and mitigating measures may be applied which would reduce the type, occurrence, and extent of adverse impacts associated with this proposal. Other measures, which are beyond the capability of this agency to apply, have also been identified. In spite of mitigating measures, some impacts are considered unavoidable. For instance, oilspills are considered statistically probable, there would be some disturbance to fishery and wildlife values, and some onshore development would occur in undeveloped areas. Based on an oilspill risk model, the probability of an oilspill impacting each significant ecological resource has been given.

4. Alternatives to the Proposed Action:

a. No Sale (Alternative II).

b. Delay the Sale (Alternative III).

c. Modify the proposed sale area by deleting 121 blocks in the northern portion (Alternative IV).

d. Modify the proposed sale area by deleting 181 blocks in the eastern portion (Alternative V).

e. Modify the proposed sale area by deleting 157 blocks in the southern portion (Alternative VI).

5. Scoping comments were requested from the following:

Federal Agencies

Department of Agriculture
- Forest Service

Department of Commerce
- National Marine Fisheries Service
- National Oceanic and Atmospheric Administration
- Office of Coastal Zone Management
- Office of Ecological and Environmental Conservation
- OCSEAP Office, Juneau

Department of Defense
- Air Force
- Army Corps of Engineers
- Department of the Army
- Naval Operations

Department of Energy
- Alaska Field Office
- Economic Regulatory Administration
- Federal Energy Regulation Commission
- Leasing Policy Development

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management, State Director
- Bureau of Mines
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Office of Aircraft Services
- Special Assistant to the Secretary

Department of Transportation
- Coast Guard

Department of the Treasury

Environmental Protection Agency

State of Alaska

The Honorable Jay S. Hammond, Governor

Department of Administration

Department of Commerce and Economic Development

Department of Community and Regional Affairs

Department of Environmental Conservation

Department of Fish and Game

Department of Health and Social Services

Department of Labor

Department of Law

Department of Natural Resources

Department of Public Works

Department of Revenue

Department of Transportation and Public Facilities

Office of Coastal Management

Office of the Governor
- Division of Policy Development and Planning, State-Federal Coordinator

University of Alaska
Marine Advisory Program

Local Government

Association of Village Council Presidents

City, Village, Traditional and/or IRA Councils for the following communities:

Akiachak
Akiak
Alakanuk
Aniak
Andreafsky Townsite
Apnautluak
Bethel
Chuathbaluk
Chefornak
Chevak
Crooked Creek
Eek
Emmonak
Goodnews Bay
Georgetown
Hooper Bay
Kasigluk
Kipnuk
Kongiganak
Kotlik
Kwethluk
Kwigillingok
Lime Village
Lower Kalskag
Marshall
Mekoryuk
Mountain Village
Napakiak
Napaskiak
Newton
Nightmute
Nome
Oscarville
Quinhagak
Pilot Station
Pitkas Point
Platinum
Red Devil
Russian Mission
Scammon Bay
Sheldon Point
Sleetmute
St. Marys
Stony River
Toksook Bay
Tuluksak
Tuntutuliak
Tununak
Upper Kalskag

Nome, Alaska
Leo Rasmussen, Mayor
Andy Edge, City Manager
Ivan Widom, City Manager

Native Organizations

Bering Straits Native Corporation
Calista Corporation
Kawerak, Inc.
Nome Eskimo Community
Nunam Kitlutsisti
Sitnasuak Native Corporation

Special Interest Groups

Acoustical Society of America
Alaska Center for the Environment
Alaska Conservation Society
Alaska Geological Society, Inc.
Alaska League of Women Voters
Alaska Miners Association
Alaska Oil and Gas Association
Alaska Professional Hunters Association

Alaska Public Interest Res. Group
Alaska Wildlife Federation and Sportman's Council, Inc.
Audubon Society, Anchorage Chapter and National Representative
Bertha's Brokerage
Chugach Gem and Mineral Society
Environmental Center, West Anchorage High School
Friends of the Earth
Geophysical Society of Alaska
Greenpeace Alaska
Isaac Walton League of America
Moening-Grey and Assoc., Inc.
Resource Development Council
Sierra Club
Trustees for Alaska
Wilderness Society

Villages Represented

Brevig Mission
Elim
Gambell
Golovin
King Island
Koyuk
Little Diomede
Savoonga
Shishmaref
St. Michael
Stebbins
Teller
Unalakleet
Wales
White Mountain

6. Technical Papers: This document makes extensive use of a series of technical papers prepared in the Alaska OCS Office (see Bibliography). The material contained in these papers is incorporated by reference throughout this EIS. Copies of these papers have been placed in a number of libraries throughout Alaska. Single copies of these technical papers are available from the Alaska OCS Office.

7. Contacts

For further information regarding this final environmental impact statement, contact:

Raymond R. Emerson or
Nancy K. Hendrix
P.O. Box 1159
Anchorage, AK 99510
907-276-2955

Ralph V. Ainger
BLM (622) U.S.D.I.
Washington, D.C. 20240
202-343-6264

NORTON SOUND

Proposed OCS Sale 57

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Summary of Environmental Impacts Statement
for Proposed Sale 57

The following statement discusses a proposal for oil and gas leasing in Norton Sound, alternatives to the proposal, major issues determined through the scoping process as well as staff analyses, and potential mitigating measures. The proposal consists of 429 blocks (approximately 2.4 million acres) to be offered for lease in Norton Sound, 14.4 to 99.2 kilometers (9 to 62 mi), 5 to 27 meters (16 to 89 ft).

The probable impacts are based in part on the assumption that the mean resource estimate of 480 million barrels of oil would be discovered and produced in the proposed lease sale area. For this amount of oil, according to the USGS, 2.8 or about 3 oilspills exceeding 1000 barrels are probable over the 20-year production life of the oil field (Table IV.A.4.b.-1). There is only a 14-percent chance that commercial quantities of oil would be found or, in other words, an 86-percent chance of <u>not</u> finding oil. If no oil is discovered, of course, there is no risk from potential oilspills.

The following discussion assumes that all laws, regulations, and orders, are in place and are part of the proposal. If the mitigating measures described in Sections II.B.1.c. and d. were adopted, it is expected that some impacts described in this environmental impact statement would be reduced. Potential effectiveness of the mitigating measures is described in Section II.B.1.c. and in each impact section of chapter IV.

Assuming discovery of the mean estimate of oil and natural gas, the proposed sale would result in a highly significant increase in total employment in the Nome census division. Additional employment directly related to petroleum activities will first occur in 1983 and is expected to peak in 1988 at 3,258 jobs. This number exceeds the current employment total for the Nome census division. However, most of the petroleum-related jobs are expected to be filled by non-resident commuters who will be housed in isolated dormitories, either offshore or onshore, during work periods and fly out of the Nome area during frequent rest periods. It is assumed that approximately 10 percent of the petroleum-related jobs will be held by new residents of the area (i.e., non-commuters) and by long-term residents. Based on this assumption, very significant increases in resident population are projected, as well as significant increases in employment only indirectly related to petroleum activities. The indirect employment impacts would include new jobs in retail trade and services, air transportation, and local governments.

The direct and indirect employment impacts could benefit residents of the Nome census division through an increase in jobholding by long-term residents of the area. On the other hand, however, it is very probable that a severe housing shortage will develop in the immediate Nome area unless local and state government, the oil industry, and local private businesses take appropriate planning steps. In addition, the rates of price inflation in the city of Nome are very likely to increase during the rapid employment increase projected for the years 1983-1988. Inflationary effects will probably be greatest for housing costs and prices charged by hotels, restaurants, and bars. The amount of travel to Nome from the onshore enclave during the off-hours will influence the number of additional jobs created by the indirect effects of petroleum

activity and thereby affect the population and inflation impacts. The more money petroleum workers spend in Nome, the greater the employment and population impacts will be. If the proposed sale resulted in the local production and sale of natural gas and heating oil, the inflationary aspects of rising energy costs could be significantly reduced throughout the area.

The demographic structure (age, sex, ethnic ratio) of the Nome community could be expected to change significantly. Because of the population increase and shift in ethnic ratio, the Nome community would probably take on a less personal character. In addition, stress related to increased economic stratification, social competition, and increased alcohol and drug use would result in a decline in overall family solidarity for both Natives and non-Natives. Native families who have recently moved to Nome and from villages and have fewer adaptive skills for coping with town life and would be most vulnerable to these stresses.

Due to their relatively small size, villages closest to Nome are probably the most vulnerable should the proposed lease sale occur. Inflation of prices in Nome would affect prices of goods brought from Nome. These include critically needed items such as fuel and fishing and hunting supplies essential for subsistence activities. For villages more distant from Nome, it is likely that few changes directly related to the proposed action would occur, except insofar as subsistence resources are affected. Positive benefits to these villages would be greatest if a few residents sought work with industry or related activities, and if this cash were returned to the village to improve subsistence technology.

Subsistence activities throughout the lease sale area are the center of village ways of life, passed on through countless generations. Disturbances to harvests, harvest activities, or to village economic and social systems which support the subsistence way of life could singly or collectively create hardship and stress to affected villages throughout the lease sale area. Competition and conflict between sport and subsistence users of fish and game could be significant, primarily during the proposed onshore development period (1981-1991). Villages most likely to be affected by an oilspill would include various Eskimo communities within Nome, including King Islanders, Diomede Islanders, and St. Lawrence Islanders dependent upon walrus, bowhead, gray, minke, and beluga whales, ringed, bearded, and spotted seals for subsistence. Other villages outside the Nome area which could be affected by oilspill events would include Gambell, Savoonga, and Diomede. Of these, Savoonga is the closest village to a high oilspill risk area, as defined by the Oilspill Risk Analysis.

Secondary effects resulting from potential oilspill events include the psychological stress caused by fear of oilspill pollution, which is now widespread throughout the lease sale area. Significant and meaningful village participation in oilspill contingency planning could mitigate against some of these fears and concerns. Other potentially significant secondary effects on subsistence include inflationary costs of goods and services purchased through Nome, indirect effects on fishing village economies, particularly in the inner Norton Sound and Yukon Delta in the event of a major oilspill, and fluctuations

in bird and marine mammal migration patterns which increase travel time and expense for subsistence harvests.

The major impact on demersal finfish, forage fish, salmon, and king crab from a major oilspill would be mainly to the egg and larval stages. These species would be most vulnerable during spawning and early development in the spring and summer, and an oilspill could cause a temporary short-term population reduction. Salmonid populations would be subject to some adverse impacts to both the adult and the out-migrating smolt. Improper design and siting of onshore facilities could alter water quality and interfere with migration, although resource agency review of permit applications would alleviate these impacts.

Most of the more than 5-million seabirds found in the northern Bering Sea nest and forage far west of the proposed sale area and in the Chirikof Basin, and they are unlikely to be affected by potential oilspills in the sale area or at the proposed tanker facility at Cape Nome. For the approximate 24-million waterfowl and shorebirds that occur in Norton Sound, the greatest risks would come from oilspills that may reach the intertidal habitats of the Yukon River Delta. Should a major oilspill impact the delta, moderate to severe local impacts to seabird populations are likely to occur. If a large oilspill contaminated a large portion of the Yukon River Delta intertidal area, major significant regional impacts to waterfowl and shorebirds are likely to occur and could have national and international significance. However, the oilspill risk analysis (Sec. IV.A.4.) indicates that it is unlikely that this would occur. Should a spill contact the Yukon River Delta, it may be impractical to clean up the spilled oil; and its natural persistence and effect on resident birds and fish may last many years.

Coastal areas of Norton Sound occupied seasonally by spotted seals, walrus, and ringed seals are at low level of risk from potential oilspills (see Sec. IV.A.4.c.). Marine mammal coastal habitats under greatest risk of contact are the eastern coast of St. Lawrence Island and the Punuk Islands. The relatively high probability of oilspills moving into offshore areas immediately west of the proposed sale area suggests that if spills occurred during periods of peak spring and fall migrations, substantial adverse effects on populations of walrus, bearded seal, spotted seal, and beluga whale are possible. Given the assumed rate of oilspills associated with the proposed sale area, however, substantial adverse effects on these migrating marine mammals are unlikely.

Endangered whale species could be adversely affected by disturbance, especially species such as the bowhead whale which have a low tolerance to human activity. Temporary avoidance of offshore areas could also be expected of gray whales. Benthic food resources used by gray whales could be significantly altered by oilspills. (See Sec. IV.B.2.e.) Significant direct impacts on peregrine falcons due to oilspills are unlikely.

Alternative II (no sale) would eliminate those impacts described in the proposal. The cancellation of proposed sale 57 could pose potentially adverse impacts on the national economy by continuing increased dependence on imported oil and gas. Impacts could occur as a result of development of alternative energy sources. Refer to the FEIS for the proposed 5-year oil and gas lease sale schedule the FEIS for OCS sale 55, Eastern Gulf of Alaska (DOI, 1980), and

Appendix H of the proposed sale 70 DEIS for a general discussion of the potential impacts that could result from various alternative energy sources. Alternative II would also eliminate any adverse impacts attributable to the proposal.

Alternative III (delay the sale) would delay potential impacts of the proposal and possibly reduce them but would not avoid them. A reduction in biological and social impacts by some unquantifiable degree could be achieved if the delay were used to strategically plan for community impacts on the Nome area and to fill biological data gaps, especially with regard to birds and marine mammals. These studies could help to better understand potential impacts on the biological resources of Norton Sound and could provide additional information to more effectively mitigate potential impacts.

Alternative IV would delete 121 blocks from the proposed sale area in the northern portion of Norton Sound. While this alternative would not significantly reduce major potential impacts on the human and biological resources of the Sound, some reductions in potential risk from oilspills could be expected for the northern coast of Norton Sound. However, although these areas are only of low potential impact with the proposed leasing plan. The major reduction in potential risk due to an oilspill would be to the eastern coast of St. Lawrence Island, which would be reduced from a high to moderate level of potential impact. The deletion of the northern blocks would lower the sociocultural impacts moderately; but it would not affect the hypothetical location of an enclave at Cape Nome and the impacts associated with such an enclave. The total number of additional jobs created in the Nome area by this alternative, including jobs held by nonresident commuters, would peak at about half the number created by the proposal. The increase in resident population would peak at about 37 percent of the population impact of the proposal. Commercial fisheries resources and potential subsistence fishing impacts would be moderately reduced as a result of this action. There would be a noticeable reduction in risks to some seabirds and their foraging habitats; however, most of the risks come from the potential tanker facility pipelines to Cape Nome These risks are similar to the proposal. The overall potential impacts to marine mammals and endangered species would probably not be significantly different from those associated with the proposal.

Alternative V would delete 181 blocks in the eastern half of the proposed sale area. This alternative would significantly reduce major potential impacts on the human and biological resources of the Norton Sound area. Given the significantly reduced resource estimates, offshore loading of oil and gas is assumed for this alternative. Total employment impacts, including jobs held by nonresident commuters, would peak at about 29 percent of the employment impact of the proposal, and the increase in resident population would peak at only 13 percent of that of the proposal. Since all OCS support would be totally or substantially enclaved, onshore major impacts on local population would be significantly reduced. Some potential reductions in risk from oilspills could be expected within Norton Sound. These reductions and would be expected to occur primarily for the northern coast of Norton Sound, as well as portions of the Yukon Delta and Stuart Island. However, these areas are of a low potential risk even with the proposed action. The eastern coast of St. Lawrence Island would be significantly reduced in potential risk to an oilspill from a high to a low potential risk factor. This alternative should significantly reduce

potential risk to birds and their habitats along the Seward Peninsula and Yukon River Delta. Similar reductions in the potential impacts could be expected for marine mammals and endangered species. Overall disturbance and potential impacts could be significantly reduced, especially in the inner Norton Sound area, due to the reduced level of activities associated with this alternative.

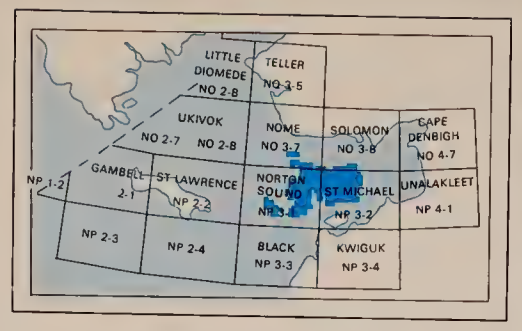
Alternative VI would delete 157 blocks in the southern part of the proposed lease sale area. According to USGS resource estimates, no oil is expected to be found in these deleted blocks. In keeping with this assumption, the expected number of oilspills and the potential impacts from oilspills would be the same as for the proposal. Therefore, this alternative significantly reduces the potential for oil-related impacts to the Yukon Delta region. If commercial quantities of oil are located in the southern deletion blocks, it would pose significant potential impacts to the Yukon Delta.

Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

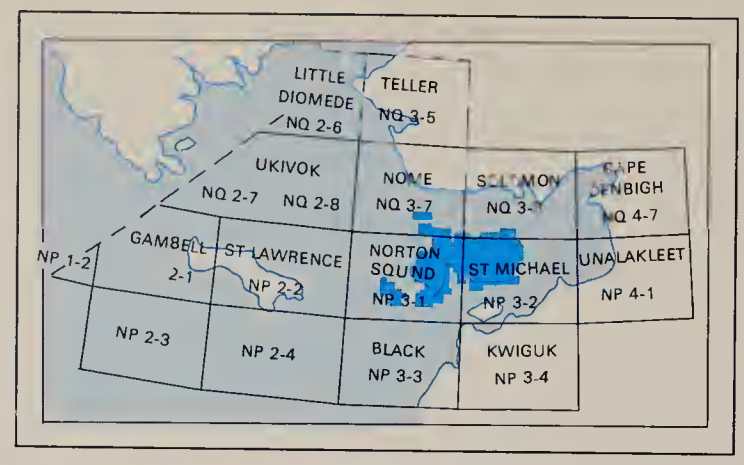
GRAPHIC NO. 1



COVERAGE OIAGRAM FOR
BLM OFFICIAL PROTRACTION OIAGRAMS

Published February 1982

NOTE: FOR THE CONVENIENCE OF THE REAOER, ALL FOLO-OUT GRAPHICS MAY BE EASILY CUT OR TORN FROM THE BINDING TO AFFORD MAXIMUM USAGE.



COVERAGE DIAGRAM FOR
BLM OFFICIAL PROTRACTION DIAGRAMS

I.

PURPOSE

FOR

ACTION

I. PURPOSE FOR ACTION

The Department of the Interior is required by law to manage the exploration and development of oil and gas resources on the Outer Continental Shelf (OCS). To help meet the energy needs of the nation in an environmentally safe manner, these resources must be developed as rapidly and yet as carefully as possible. While overseeing this development, the Secretary of Interior must balance orderly resource development with protection of the human, marine, and coastal environments; ensure that the public receive a fair return for these resources; and preserve and maintain free enterprise competition.

In compliance with the Outer Continental Shelf Lands Act, as amended, the Secretary of the Interior submits a proposed 5-year leasing program to the Congress, the Attorney General, and the governors of affected states. The Secretary further reviews, periodically revises as necessary, and maintains the oil and gas leasing program. Goals of the leasing program include the orderly development of OCS oil and gas resources in an environmentally acceptable manner and the maintenance of an adequate contribution of OCS production to the national supply to reduce dependence on foreign oil. Refer to Section I.A. for a detailed discussion of the leasing process.

Full development of OCS resources is an integral part of the National Energy Plan (Executive Office of the President, Energy Policy and Planning, 1977). The United States has three overriding energy objectives outlined in that plan:

> To reduce dependence on foreign oil and vulnerability to supply interruptions;
>
> To keep U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation; and
>
> To have renewable and essentially inexhaustible sources of energy for sustained economic growth.

The OCS leasing program does not represent a decision to lease in a particular area. Instead, it represents the Department's intent to consider leasing in certain areas and to proceed with the leasing of such areas only if it should be determined that leasing and development would be environmentally acceptable and technically and economically feasible.

As a part of the overall OCS leasing program, proposed sale 57 in the Norton Sound is presently scheduled for November 1982.

A. Leasing Process

The Outer Continental Shelf Lands Act of 1953 (67 Stat. 462), as amended, charges the Secretary of the Interior with administering mineral exploration and development on the outer continental shelf (OCS), as well as conserving natural resources of the shelf. The law, inter alia, requires that the Secretary of the Interior develop oil and gas in an orderly and timely manner to meet the energy needs of the country; to protect the human, marine, and coastal environments; and to receive a fair and equitable return on the resources of the OCS. The Secretary delegated responsibility for the leasing of submerged federal lands to the Bureau of Land Management (BLM) (43 CFR 3300)

and the responsibility for the supervision of offshore operations after lease issuance to the U.S. Geological Survey (USGS) (30 CFR 250). BLM works closely with USGS, particularly on technical matters. USGS also supervises and regulates exploration, development, and production activities after the leases are issued. The leasing process includes the following decisionmaking steps implemented for proposed sales and, where applicable, a specific discussion is included for this proposal.

1. Leasing Schedule: The Outer Continental Shelf Lands Act, as amended, requires the Secretary to develop a 5-year OCS oil and gas leasing program, to be reviewed at least annually. This program must consist of a schedule of proposed lease offerings which the Secretary determines will best meet national energy needs for the 5-year period following its approval. The current schedule, approved in June 1980 (Figure I-A.1-1), covers the period from mid-1980 through mid-1985 and provides for 36 possible lease sales, including five reoffering sales. These sales reoffer rejected-bid or no-bid tracts which were offered for sale in the previous calendar year. The June 1980 schedule proposes ten lease offerings offshore Alaska. Included is the proposal on sale 57 for the Norton Sound in September 1982. In June 1981, the Secretary of the Interior published a draft supplement to the final environmental statement on a proposed revised 5-year leasing schedule. This supplement considers a 5-year schedule consisting of 42 oil and gas lease sales in 17 areas of the OCS in the period between January 1982 and December 1986 (Fig. I.A.1-2). The new proposed schedule moves proposed sale 57 from September 1982 to November 1982. The current approved June 1980 schedule will remain in effect until the Secretary makes his final decisions on the proposed revised program, after public input and completion of the NEPA process. The proposed revised 5-year program was submitted to Congress and to affected state governors and was made public in July 1981.

On October 6, 1981, the U.S. Court of Appeals for the District of Columbia Circuit found several violations with the June 1980 leasing program. The Court did not enjoin or vacate the current program but remanded it to correct the violations and to reapprove a new program. The Secretary is expected to submit a proposed schedule to congress in May.

2. Request for Resource Reports: Resource reports for a specific lease area are requested from numerous federal and state agencies, generally from 2½ to 3 years prior to the scheduled lease sale date. These reports provide valuable geological, environmental, biological, oceanographic, navigational, recreational, archaeological, and socioeconomic information on the leasing area to be offered. They are an important factor in determining the suitability for leasing and the possible need for mitigating measures for certain blocks within the leasing area. Resource reports for proposed lease sale 57 were requested from various federal and state agencies on December 14, 1978, and were due to the Alaska OCS Office on February 28, 1979.

3. Call for Nominations and Comments: The Call is a request for information and is published in the Federal Register. Responses concerning which blocks should be included in the lease sale are requested from oil companies, governmental agencies, private citizens, environmental groups, and the public in general. The Call for proposed sale 57 was published in the Federal Register (44 FR 25274) on April 30, 1979, and requested nominations and comments by November 1, 1979. The Call included 4,709 blocks, covering 10

FINAL 5-YEAR OCS OIL & GAS LEASING SCHEDULE — JUNE 1980

PROPOSED SALE AREA	PROPOSED DATE	1980 J F M A M J J A S O N D	1981 J F M A M J J A S O N D	1982 J F M A M J J A S O N D	1983 J F M A M J J A S O N D	1984 J F M A M J J A S O N D	1985 J F M A M J J A S O N D
A62 Gulf of Mexico	9/80	F P $^{S}_{C}$ R N S					
55 Gulf of Alaska	10/80	F P $^{S}_{C}$ R N S					
62 Gulf of Mexico	11/80	F P $^{S}_{C}$ R N S					
53 Central N. Calif.	5/81	E H F P	$^{S}_{C}$ R N S				
RS-1 Reoffering Sale	6/81		P $^{S}_{C}$ R N S				
A66 Gulf of Mexico	7/81	E H F	P $^{S}_{C}$ R N S				
56 South Atlantic	8/81	E H	F P $^{S}_{C}$ R N S				
60 Cook Inlet	9/81	E H	F P $^{S}_{C}$ R N S				
66 Gulf of Mexico	10/81	E H F	P $^{S}_{C}$ R N S				
59 Mid-Atlantic	12/81	E	H F P $^{S}_{C}$ R N S				
67 Gulf of Mexico	3/82	C D T	E H F P $^{S}_{C}$	R N S			
RS-2 Reoffering Sale	6/82			P $^{SC}_{R}$ N S			
68 Southern California	6/82	D T	E H F	P $^{S}_{C}$ R N S			
69 Gulf of Mexico	8/82	C D T	E H F	P $^{S}_{C}$ R N S			
57 Norton Basin	9/82	T E H		F P $^{S}_{C}$ R N S			
52 North Atlantic	10/82	D T E H		F P $^{S}_{C}$ R N S			
70 St. George Basin	12/82	T E		H F P $^{S}_{C}$ R N S			
71 Beaufort Sea	2/83	T E		H F P $^{S}_{C}$ R N S			
72 Gulf of Mexico	3/83	C D T		E H F P $^{S}_{C}$ R N S			
61 Kodiak	4/83	C D T		E H F P $^{S}_{C}$ R N S			
73 California	5/83	C D T		E H F P $^{S}_{C}$ R N S			
RS-3 Reoffering Sale	6/83			P $^{SC}_{R}$ N S			
74 Gulf of Mexico	9/83	C D T		E H F	P $^{S}_{C}$ R N S		
75 No. Aleutian Shelf	10/83	C D T		E H	F P $^{S}_{C}$ R N S		
76 Mid-Atlantic	11/83	C D T		E H	F P $^{S}_{C}$ R N S		
78 South Atlantic	1/84	C D T		E	H F P $^{S}_{C}$ R N S		
79 Gulf of Mexico	3/84		C D T		E H F P $^{S}_{C}$ R N S		
RS-4 Reoffering Sale	5/84					P $^{SC}_{R}$ N S	
80 California	6/84	C D T			E H F	P $^{S}_{C}$ R N S	
81 Gulf of Mexico	7/84		C D T		E H F	P $^{S}_{C}$ R N S	
82 North Atlantic	10/84		C D T			E H F P $^{S}_{C}$ R N S	
83 Navarin Basin	12/84	C D T				E H F P $^{S}_{C}$ R N S	
84 Gulf of Mexico	1/85			C D T			E H F P $^{S}_{C}$ R N S
☆85 Chukchi Sea	2/85	C D T				E H F P $^{S}_{C}$ R N S	
86 Hope Basin	5/85	C D T				E H F P $^{S}_{C}$ R N S	
RS-5 Reoffering Sale	6/85						P $^{SC}_{R}$ N S

U.S. DEPARTMENT OF THE INTERIOR — March 3, 1849

Cecil D. Andrus

Secretary of the Interior

C - Call For Nominations
D - Nominations Due
T - Tentative Tract Selection
E - Draft Environmental Statement
H - Public Hearing
F - Final Environmental Statement
P - Proposed Notice of Sale
$^{S}_{C}$ - State Comments Due
R - Energy Review
N - Notice of Sale
S - Sale

☆ The holding of the Chukchi Sale at this time is contingent upon a reasonable assumption that technology will be available for exploration and development of the tracts included in the sale.

INT 4056-80

Figure I.E.-1

Figure I.A.1-2

PROPOSED 5-YEAR OCS OIL AND GAS LEASING SCHEDULE

PROPOSED SALE AREA	SALE DATE
60 LOWER COOK/ SHELIKOF STRAIT	9/81
RS 2	6/82
71 DIAPIR FIELD	9/82
57 NORTON BASIN	11/82
70 ST. GEORGE BASIN	2/83
75 NO. ALEUTIAN SHELF	4/83
83 NAVARIN BASIN	3/84
87 DIAPIR FIELD	6/84
88 NORTON BASIN	10/84
89 ST. GEORGE BASIN	12/84
85 BARROW ARCH	2/85
92 N. ALEUT BASIN	4/85
86 HOPE BASIN	7/85
100 S. ALASKA *	10/85
107 NAVARIN BASIN	3/86
97 DIAPIR FIELD	6/86
99 NORTON BASIN	10/86
101 ST. GEORGE BASIN	12/86

C – Call for Information
D – Information Due
A Area Selection
E – Draft Environmental Impact Statement
H -- Public Hearing
F -- Final Environmental Impact Statement
P -- Proposed Notice of Sale
G – Governors' Comments Due
R -- DOE Review
N - Notice of Sale
S – Sale
* Includes Cook Inlet, Shumagin, Kodiak & Gulf of Alaska

Alaska Outer Continental Shelf Office
July 15 , 1981

million hectares (24.8 million acres), located in the northeast segment of the Bering Sea and underlying the Norton Sound off the western coast of Alaska. Blocks with the greatest potential for oil and gas were identified, as well as areas of significant environmental concern. In response to the Call, 20 comments were submitted; and 11 companies nominated 4,704 blocks (approximately 10 million hectares, or 24.8 million acres).

4. Tentative Tract Selection: Using information received from the Call for Nominations and Comments, together with recommendations from USGS and Fish and Wildlife Service (FWS), state comments, and the Department of the Interior's own environmental, technological, and socioeconomic information, the Secretary selects for leasing a tentative list of blocks for further consideration in an environmental impact statement (EIS). The Secretary of Interior announced selection of 429 blocks in the Norton Sound comprising approximately 988,416 hectares (2.4 million acres) on February 20, 1980.

5. Scoping Meetings: Scoping meetings provide an opportunity for the OCS staff to meet with people in their own communities to surface important issues and alternatives to the proposed action. The OCS office works together with other federal and state agencies, the oil and gas industry, environmental groups, and concerned individuals to identify critical issues. Scoping meetings were conducted in March and April 1980, at central locations in the Norton Sound area; specifically, Nome, Unalakleet, Golovin, Alakanuk, and Stebbins. Additional meetings were held in Juneau and Anchorage to gather information. Refer to Sections I.F., and VI.B. and Appendix H for detailed discussions of the scoping process for proposed sale 57.

6. Preparation of Draft Environmental Impact Statement (DEIS): The issues and alternatives raised in the scoping meetings are further developed in the DEIS. Preparation of the DEIS is required in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA). As an integral part of the DEIS development, a "synthesis meeting" is held prior to the actual writing of the DEIS. This BLM-sponsored meeting assembles researchers who are knowledgeable concerning the information available in a specific lease area. The Norton Sound Synthesis meeting was held in Anchorage on October 1980. Refer to Section III.F. for a complete description of BLM-sponsored studies.

Included in the DEIS is a description of the marine and onshore environments, a detailed analysis of possible adverse impacts on the environment (including cumulative impacts as a result of other projects in the area), potential mitigating measures, any irreversible or irretrievable commitment of resources, the alternatives to the proposal, and the record of consultation and coordination with others in preparation of the statement. When the availability of the DEIS is announced in the Federal Register, the Alaska OCS Office delivers copies of the EIS to the Office of the Governor. The DEIS on Norton Sound was available in June 1981.

7. Endangered Species Consultation: Pursuant to Section 7 of the Endangered Species Act, consultation with appropriate federal agencies is required when there is reason to believe that a species that is on the list as endangered or threatened (or is proposed to be listed as such) may be affected by a proposed action. A formal consultation meeting between BLM, USGS, FWS, and National Marine Fisheries Service (NMFS) was held on June 25, 1980, to

convey information on the exploration phase of proposed federal lease sales in the Bering Sea and to obtain biological opinions, as necessary, regarding potential effects of exploratory activities on endangered species. Subsequently, a biological opinion on the exploratory phase was received from the U.S. Fish and Wildlife Service on August 22, 1980, and amended on September 18, 1980. (Refer to Section IV.B.2.e. and Appendix E.) Although a biological opinion on probable effects on endangered whales was expected on or before September 23, 1980, NMFS and BLM mutually agreed to an extension of the response period. The biological opinion is included as Appendix G. As required under the Endangered Species Act of 1973, as amended, Section 7 consultation will continue, as needed, and as may be related to development and production phases of the proposed sale. (See Section IV.B.2.e. for further information on the status of endangered species consultation.)

8. Public Hearings: A review period follows release of the DEIS. Specific dates and locations for public hearings to record comments, after the review period, are announced in the Federal Register. Oral and written comments are obtained and incorporated into the FEIS, which is then made available to the public. Public hearings were held in Savoonga, Unalakleet, and Nome on October 5; in Kotlik, Emmonak, and Bethel on October 6; and in Anchorage October 8, 1981.

9. Secretarial Issue Document (SID): Following the preparation of the FEIS, a SID is developed for use by the Secretary of the Interior. The SID brings to the decisionmaker's attention all factors associated with the proposed action by presenting the significant issues and identifying the alternative actions. Issues include environmental and physical factors based upon the EIS, including potential economic and social impacts of the proposal and its affect on the Department's program. The SID and the FEIS provide the necessary information to the Secretary to make a decision on various sale options, including whether or not to hold a sale, and if so, under what terms and conditions the sale should be held.

10. Proposed Notice of Sale: This notice is published in the Federal Register at least 90 days before the proposed sale date. It is also sent to the governors of any affected states, who then have 60 days to submit comments to the Secretary regarding the size, timing, or location of the proposed lease sale (43 CFR 3315.3). This notice is scheduled to be published in July 1982.

11. Decision and Notice of Sale: After all of the above steps have been taken, the Secretary makes his final decision on whether to hold the sale and, if so, the terms to be included in the final Notice of Sale. The final notice, published in the Federal Register at least 30 days before the sale, may be quite different from the preliminary notice; i.e., blocks may be deleted, bidding systems may be altered, or stipulations may be added or amended. The final notice is prepared and reviewed principally by USGS, FWS, and the Department of Energy (DOE).

12. Lease Sale: Sealed industry bids for individual blocks are opened, read, and recorded at the lease sale. After BLM and USGS assess the adequacy of the bids, leases may be awarded to the highest qualified bidders, with stipulations. The Department of Justice reviews all bids for compliance with anti-trust laws. The Secretary reserves the right to withdraw blocks from

consideration at the proposed sale as well as to reject any bids received. The Secretary has 60 days to accept or reject all bids. Proposed sale 57 is tentatively scheduled for November 1982.

After leases are awarded by BLM, USGS is the agency designated with the responsibility for managing and monitoring operations conducted on the leasehold resulting from a sale. Prior to exploration, the lessee must submit an exploration plan (the Application for Permit to Drill) and environmental report to USGS for approval. BLM, FWS, and the state are provided an opportunity to comment on this plan.

B. Leasing History

There has been no federal OCS leasing in the Bering Sea. Petroleum industry interest in this area has been strong. Refer to paragraphs 3 (Call for Nominations) and 4 (Tentative Tract Selection) in the preceding section (I.A.) for specific information regarding the leasing process for Norton Sound.

The State of Alaska 5-Year Oil and Gas Leasing Schedule reflects an offshore sale in Norton Basin (sale 38) for the first quarter of 1983. The Alaska Department of Natural Resources issued a call for nominations, and comments for nominations, to be submitted by May 30, 1981, for the offshore coastline area extending to the 3-mile seaward limit of state jurisdiction around Norton Sound (Fig. I.B.-1).

C. Legal Mandates and Authority

The description of legal mandates and authority for OCS leasing is contained in BLM-Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities (Casey, 1981). One of the more important discussions in the paper is an explanation of the Secretary's authorities on the OCS. The technical paper also contains the following:

Summary of the OCS Lands Act, as amended, including a detailed discussion of the requirements for federal/state coordination, establishment of compensatory funds, and the environmental studies program.

Discussion of responsibilities of other federal agencies with respect to OCS.

A discussion of the Secretary's authority to suspend operations and cancel a lease for environmental reasons.

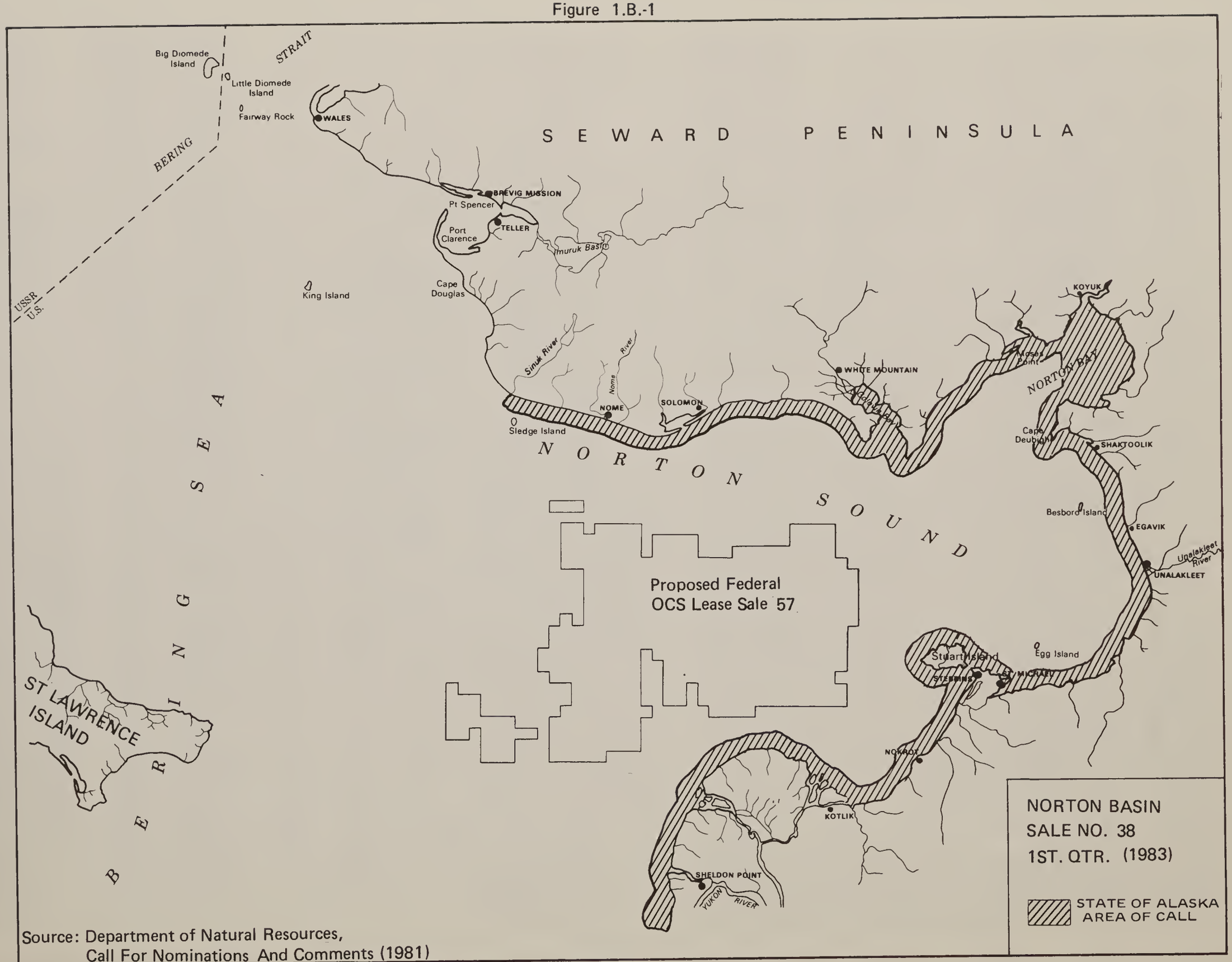
The functions of the National OCS Advisory Board and the Intergovernmental Planning Program (IPP). (The IPP primarily serves an advisory function on technical matters of the OCS program.)

OCS Operating Orders, prepared by USGS, for the arctic and Gulf of Alaska areas.

D. Federal Regulatory Responsibilities

Technical Paper No. 4 (Casey, 1981) outlines federal regulatory responsibilities that affect the OCS leasing program. Responsibilities of the

Figure 1.B.-1



Source: Department of Natural Resources,
Call For Nominations And Comments (1981)

STATE OF ALASKA SALE NO. 38 – NORTON BASIN

Departments of Interior, Transportation, Commerce, and Energy, as well as those of the U.S. Army Corps of Engineers, the Environmental Protection Agency, and the Interstate Commerce Commission.

E. Results of the Scoping Process

The scoping process for proposed lease sale 57 consisted of 14 meetings held at central locations adjacent to Norton Sound, as well as the urban areas of Anchorage and Juneau. (Refer to Section V., Consultation and Coordination, as well as Appendix H, for detailed discussions of the scoping process for proposed lease sale 57.)

Results of the scoping meetings and the issues raised in written comments were analyzed, and the following major issues were identified:

Major Issues	Specific Concerns
Maintenance of lifestyle.	
Oilspills:	Lack of cleanup technology. Refer to Sections III.B. and IV.B.1.
Subsistence:	Marine mammals, fish, and birds. Refer to Sections IV.A.6. and IV.B.1.c.
	Compensation for lost subsistence due to oil and gas activities. Refer to Sections II.B.1.b., IV.B.3., and IV.B.1.c.
	Noise disturbance from drilling, aircraft, and boats. Refer to Sections II.B.1.b., IV.B.2.c., IV.B.2.d., and IV.B.2.e.
Ice:	Lack of cleanup technology for a spill in or under the ice. Refer to Section III.A.1.
	The movement, pressure, and force of ice against an oil structure. Refer to Section IV.A.1. Ice scouring. Refer to Section II.A.1.
Local hire:	Will training programs be provided by oil companies? Refer to Section IV.B.3.
Local economy:	Increasing prices to villagers. Refer to Section III.B.4. and IV.B.3.b.
	The boom-and-bust syndrome. Refer to Section IV.B.3.b.
	The influx of people. Refer to Section III.B.1. and IV.B.1.a.

Commercial fisheries:	Salmon, herring, and crab. Refer to Section III.C.2. and IV.B.2.b.
	Bottomfishing potential. Refer to Section IV.B.2.b.
Local community control:	Increasing crime rates. Refer to Section III.B.2. and IV.B.1.b.

The following were proposed in the scoping process as mitigating measures that should be considered in the environmental impact statement:

Orientation program.
Restriction on aircraft disturbance.
Pipeline burial below the ice scour line.
Test structure.
Seasonal drilling activities.
The oil companies' demonstration of "effective cleanup mobilization plan" for each site.
Designation of fairways for vessel traffic.

Refer to Section II.B.1.c. for a discussion of potential mitigating measures for the proposal.

Block deletion alternatives proposed in the scoping process, analyzed, and included in this environmental impact statement are as follows:

The Northern Deletion, Alternative IV (Fig. II.B.4.a.-1).

The Eastern Deletion, Alternative V (Fig. II.B.5.a.-1).

The Southern Deletion, Alternative VI (Fig. II.B.6.a.-1).

In addition to the block deletion alternatives, strong support for the No Sale (Alternative II) and Delay the Sale (Alternative III) was stated. The following reasons were listed for delaying the proposed sale in Norton Sound:

Explore onshore areas before developing the offshore.

Delay 5 years for further studies and local planning efforts.

Delay proposed sale 57 pending resolution of issues resulting from Beaufort Sea litigation.

Wait until there is development of adequate technology for the Norton Sound area for drilling operations and oilspill cleanup.

Wait until there are adequate measures for protection of the Yukon River Delta area.

Delay 3 years for completion of local coastal zone management plans.

Allow more time for additional research.

II.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section describes the proposed action and each alternative to the proposal. It also outlines the various production assumptions, development scenarios, resource estimates, and mitigating measures which shape the environmental analysis contained within this document. Finally, this section includes a summary of probable impacts of the proposed action and each of its alternatives. Refer to Section IV for more detailed analysis of probable impacts.

A. Resource Estimates and Production Assumptions

The resource estimates used in this EIS assume that favorable geologic conditions exist so that oil and gas are present and are contained in traps within the proposed lease area in commercial quantities. However, the USGS has estimated that there is an 86-percent chance that no commercial oil, and a 74-percent chance that no commercial gas resources, will be discovered within the proposed sale area. Conversely, there is a 14-percent chance and a 26 percent chance for discovery of commercial oil and gas, respectively. This degree of risk applies to all alternatives discussed within this EIS. The risk factor is subject to modification as more is learned about the area. Any citation of this unrisked resource data should clearly state that the information assumes discovery. Estimates of resource potential are speculative, particularly in areas such as Norton Sound, where geologic information is limited and the presence of oil and gas has not been demonstrated.

The method that USGS used to develop the resource estimates involved an analysis of geophysical and geologic information on subsurface and adjacent surface formations. This information became the input to engineering and economic calculations to determine minimum commercial field sizes. These minimum field sizes, plus the hydrocarbon structure information, were statistically blended in a model using a Monte Carlo (random) technique to produce the proposed lease area's commercial resource distribution curve. Then, assuming that commercial resources were found, the minimum case, the mean case, and the maximum case were rerun using a Monte Carlo (random) technique to determine production factors such as number of wells and reservoir decline patterns.

The resource estimates are based on primary production. Improvement of drilling technology and exploration science could lead to an increase in the estimate of recoverable resources. Differing assumptions regarding exploration and development costs, operating expenses, the price and market for oil and natural gas, taxes, depreciation, and royalty and production rates would affect the estimates of the recoverable resources. Similarly, a significant change in one or several of these factors in the future could affect the amount of resources actually recovered.

Table II.A.-1 is a USGS comparison of resource estimates for the maximum, mean, and minimum levels of recoverable oil and natural gas within the proposed lease area. The indicated resources are based on unrisked statistical resource estimates.

The environmental analysis for each alternative is based on the assumption that the average case of resource development would result based on the mean production estimate shown in Table II.A.-1. The maximum and minimum cases are analyzed in Appendix F.

Table II.A.-1

Resource Comparison of the Proposal
and Each of Its Alternatives

	[1/]Minimum Case	Alternative I (Proposal) Mean Case	[2/]Maximum Case	Alternative IV Mean Case	Alternative V Mean Case	Alternative VI Mean Case
[3/]Oil	90	480	1,520	260	90	480
[4/]Gas	0.9	2,010	5,040	1,600	1,560	1,740

[1/]The minimum case reflects the amount of hydrocarbons which could be found in the proposed sale area based on 95 percent statistical probability. In other words, if hydrocarbons are located within the sale area, there is a 95 percent chance that they will be equal to 90 MMbbls of oil and 0.9 bcf of natural gas.

[2/]The maximum case reflects the amount of hydrocarbons which could be found in the proposed sale area on a 5 percent statistical probability.

[3/]In million of barrels.

[4/]In billions of cubic feet.

Source: USGS (1980).

Alternative I is represented by the mean resource level of the proposed action. Alternative II is the no sale case. Alternative III portrays a situation in which the sale of the blocks under study is delayed 3 years. Resource estimates indicated for Alternatives IV, V, and VI are also based on the mean level resource estimate.

In the primary developmental scenario of the proposed action, as well as that of Alternatives IV and VI, crude oil and natural gas produced in the Norton Sound are expected to be transported via pipeline to an oil storage/gas liquefaction terminal located at Cape Nome. After treatment, the hydrocarbons would be shipped via ice-breaking tankers to a large transshipment terminal located on the Aleutian Chain or Alaska Peninsula. At that point, the hydrocarbons would be reloaded into larger, standard design LNG and crude carriers for shipment to market. Another possible scenario would be the direct shipment of hydrocarbons to market in the United States. Possible locations for transshipment facilities on the Aleutian Chain or the Alaska Peninsula are discussed in the EIS for proposed OCS lease sale 70 (St. George Basin), as well as in Alaska OCS Technical Paper No. 1.

Another possible developmental scenario features the offshore production, processing, and loading of hydrocarbons. Although the resources of the proposal and each of its alternatives could be developed by offshore processing techniques, it is believed that offshore loading would be most likely for Alternative V, due to its low estimated resources.

The exploratory, developmental, and production infrastructure scenarios for each alternative will be discussed under the appropriate headings in Sections II and IV. Featured in Section II and accompanying the scenario discussion will be a description of each alternative.

The infrastructure scenarios represent a combined opinion of the Alaska OCS Office, USGS, the consulting firm of Dames and Moore, and the Atlantic Richfield Company. The scenario discussed within this document, as well as the physical description of the alternatives and their resource estimates, receive expanded treatment in Alaska OCS Technical Paper No. 1, Resources, Developmental Time Frames, Infrastructure Assumptions and Block Deletion Alternatives for Proposed Federal Lease Sales in the Bering Sea and Norton Sound.

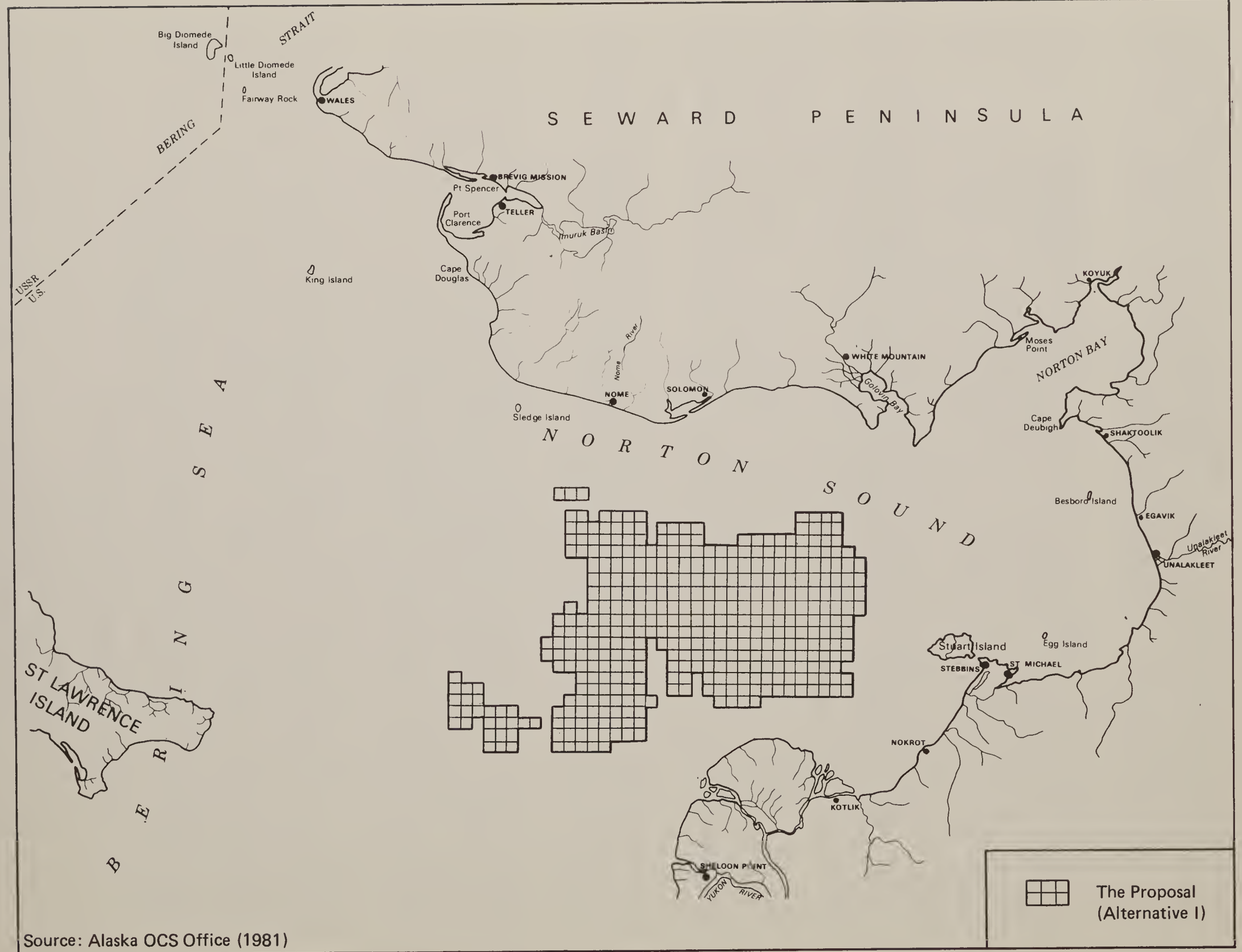
Because of the many assumptions involved, potentially affected communities should not use this analysis as "a local planning document" or as a forecast or prediction of the future. All facility locations and scenarios described in this EIS, which are intended to represent only a few likely locations and scenarios, serve simply as a basis for identifying characteristic activities and resulting impacts for this EIS. They do not represent a BLM recommendation, preference, or endorsement of facility sites or development schemes. Local control of events may be accomplished through planning, zoning, and land ownership, as well as other state and local laws and regulations.

B. Analysis of Proposal and Alternatives

1. Alternative I (Proposal):

a. Description of the Proposal: The 429 blocks contained in this proposed action (Fig. II.B.1.a.-1) are scheduled for sale in November

Figure II. B.1.a.-1



Source: Alaska OCS Office (1981)

NORTON SOUND PROPOSED OCS LEASE SALE 57

1982. Total aerial extent of the proposed lease sale is 988,416 hectares (2.4 million acres). The blocks which comprise the proposed action are located 14.4 to 99.2 kilometers (9 to 62 mi) offshore in water depths which range from 5 to 27 meters (16 to 89 ft). The average water depth of the blocks is estimated at 16.7 meters (55 ft). (See Appendix A for summary of these blocks by water depth and distance to shore.) USGS sets the hydrocarbon resource estimates for the proposal at 480 million barrels (MMbbls) of oil and 2.01 trillion cubic feet (tcf) of gas (see Table II.A.-1). The is approximately 14 percent for oil and 26 percent for non-associated gas. This success probability applies to the proposal as well as to each of its alternatives.

Basic Development Assumptions: Environmental, social, and economic impacts may occur as a result of a federal decision to permit exploration for a commercially producible offshore oil and gas field. The levels of oil and gas estimated to be discovered are the main factor in estimating the amount of activity and impact caused by such a decision.

The focus of this document is on the probability that commercial quantities of hydrocarbons will be found. This then alerts the Secretary of Interior to potential impacts. Further, discussion of oil and gas development activity centers on the more probable level of assumed resource discovery (the mean case), rather than the more extreme minimum or maximum.

Refer to Section IV.A.3.a. and b. and Appendix F for detailed discussions of the resources and activities, based on the minimum and maximum cases, of the proposed action.

Estimated Activity Resulting from the Proposal: The amount of commercial activity that may be generated in Norton Sound depends on many variables. Chief among them would be the amount of recoverable resources. Also of importance would be the availability of capital, work force, equipment, and the willingness of regional and local authorities to work with industry in the implementation of development programs. The quantity of recoverable resources (oil and natural gas) is presently unproven. The following discussion assumes a degree of activity which might be associated with a mean level discovery of hydrocarbons. (Refer to resource estimates in Table II.A.-1.)

Estimated Activity Based on the Mean Scenario: If the sale is held, the exploratory period of the proposal (Alternative I) could begin in 1984 and would gradually end by 1987 (see Table II.B.1.a.-1). Peak exploratory drilling should occur in 1986 with 13 wells completed by 5 drilling rigs. The average depth of these exploration and delineation wells is expected to be about 2,956 meters (9,700 ft). Maximum employment attributable to exploratory activities should occur in 1986 with the expenditure of 33,690 work months (approximately 2,800 people) of labor.

If hydrocarbons are located during the exploratory period, it is hypothesized that the developmental period could begin as early as 1985 with the placement of an ice-resistant platform or island. The developmental and exploratory phases are not mutually exclusive. The developmental period should cease by 1991. A review of Table II.B.1.a.-1 indicates that during this period 9 production platforms may drill as many as 172 production and service wells. Average depth of the wells should be about 1,981 meters (6,500 ft).

Table II.B.1.a.-1

Norton Sound Proposed Sale 57
Mean Case Scenario
(Alternative I)

Estimated Schedule of Development and Production

Sale Year	Cal. Year	Expl. & Delin. Wells No.	Expl. & Delin. Wells Rigs	Plats. and Equip	Production & Service Wells No.	Production & Service Wells Rigs	Pipe-line Route Miles	Shore Terms. No.	Production Oil MMbbl	Production Gas bcf
0	1982									
1		6	2							
2		11	4							
3		13	5	1						
4		11	4	2						
5		4	2	3	15	2	93	0.7		
6				3	45	5	93	0.9	25	25
7					89	10		0.3	78	78
8					14	2		0.1	100	123
9					9	1			78	142
10									51	135
11									35	119
12									26	108
13									19	103
14									14	97
15									11	95
16									9	91
17									7	90
18									6	89
19									4	87
20									4	87
21									3	86
22									3	85
23									2	83
24									2	70
25									2	52
26									1	37
27										28
28										21
29										17
30										13
31										11
32										9
33										7
34										6
35										5
36										4
37										4
38										3
TOTAL		45	17	9	172	20	186	2	480	2010

Source: USGS, 1980; BLM/Alaska OCS Office, 1980.

Pipeline construction would be expected to begin in 1987, ending in 1988. A total of 299 kilometers (186 mi) of 18-inch oil pipe and 299 kilometers (186 mi) of 14-inch gas pipe may be laid. The pipelines would be entirely underwater, except for the final few kilometers which would be on land or through an ice-resistant, rubble-mound causeway. It is expected that the underwater pipeline would be buried. The pipelines would terminate in a storage, processing and loading complex near Cape Nome. Oil production is expected to begin in 1988, reaching peak production of 100 MMbbls in 1990. Gas production should begin in 1988, reaching a maximum output of 142 bcf in 1991 (Table II.B.1.a.-1). Maximum employment realized from developmental activities would be expected to occur in 1988 with the expenditure of 39,581 work months (approximately 3,300 people) of labor.

Beyond 1991, industry activities are expected to be confined to production. The volume of recoverable hydrocarbons is expected to gradually decline with oil operations ceasing 26 years (2008) after the sale date, and gas reserves exhausted 38 years (2020) following the sale date. Employment during this period is expected to remain constant at 11,000-11,500 work months, or at least until the depletion of oil reserves.

b. Mitigating Measures That Are Part of the Proposed Action: Laws, regulations, or orders that provide mitigation are considered part of the proposal. Examples include the OCS Lands Act, which grants broad authority to the Secretary of the Interior to control lease operations; the OCS Operating Orders; coastal zone management regulations; the Fisherman's Contingency Fund; and the Offshore Oil Pollution Control Fund. (Refer to Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities, for detailed discussions. Also, refer to Appendix C, Summary of Arctic OCS Operating Orders, prepared by USGS.)

c. Potential Mitigating Measures: The following measures are proposed to reduce or eliminate impacts identified in Section IV. A Secretarial decision on the following mitigating measures has not occurred; they are noted here only as potential measures which could further mitigate impacts resulting from this proposed lease sale. Some of these measures have been imposed by the Secretary in past lease sales and are likely to continue to be used unless more effective mitigating measures are identified or developed. If any of these measures are adopted, they will appear in the Final Sale Notice. The impact analysis in this environmental statement does not assume that the following measures are in place. The measures are, however, evaluated in the Effect of Additoinal Mitigating Measures sections within each assessment (Sec. IV) and are briefly described in this section.

The potential mitigating measures described in this section are based on suggestions made during the scoping process for proposed sale 57, comments in response to the Call for Nominations and Tract Selection, and the analyses completed by staff members of the Alaska OCS Office. All available information on potential mitigating measures for Norton Sound was evaluated in the environmental assessment process. In accordance with Department Memo No. 655, field-level interagency coordination meetings were held on February 27, March 13, and December 7, 1981, to further discuss and evaluate potential measures. Headquarters' meetings were held May 8, 1981 and January 19, 1982. Agencies in attendance at the meetings included USGS, FWS, NPS, and NMFS.

Protection of Cultural Resources

If this measure were adopted, it is most likely that it would be invoked for 23 blocks within the sale 57 area. These blocks are 859; 860; 861; 948; 949; 951 through 954; 982 through 998; 1036 through 1042 of Official Protraction Diagram No. 3-7. In the proposed sale area, these blocks have medium probability of having been inhabited during prehistoric and historic times (see Graphic No. 7). The definition of medium on a scale of low-medium-high results from a process of ranking specific areas for the region in terms of nearshore historical concentrations of marine productivity by the University of Alaska researchers which included archaeologists, geologists, and paleontologists. The ranking "is based on physical evidence and should be repeatable by different investigators regardless of the artificial ranking systems chosen for analysis" (Dixon, 1976, p. 204).

> If the DCM (Deputy Conservation Manager, Offshore Field Operations, Alaska Region, USGS), has reason to believe that a site, structure, or object of historical or archaeological significance (hereinafter referred to as a "cultural resource"), may exist in the lease area and the DCM gives the lessee written notice that the lessor is invoking the provisions of this stipulation, the lessee shall upon receipt of such notice comply with the following requirements.
>
> a) Prior to any drilling activity or the construction or placement of any structure for exploration or development on the lease, including but not limited to, well drilling and pipeline platform placement (hereinafter in this stipulation referred to as "operation"), the lessee shall conduct remote sensing surveys to determine the potential existence of any cultural resource that may be affected by such operations. All data produced by such remote sensing surveys, as well as other pertinent natural and cultural environmental data, shall be examined by a qualified marine survey archaeologist to determine if indications are present suggesting the existence of a cultural resource that may be adversely affected by any lease operation. A report of this survey and assessment prepared by the marine survey archaeologist shall be submitted by the lessee to the DCM and the Manager, Bureau of Land Management (BLM), Outer Continental Shelf (OCS) Office, for review.
>
> b) If such cultural resource indicators are present, the lessee shall (1) locate the site of such operation so as not to adversely affect the identified location; or (2) establish, to the satisfaction of the DCM, on the basis of further archaeological investigation conducted by a qualified marine survey archaeologist or underwater archaeologist using such survey equipment and techniques as deemed necessary by the DCM, either that such operation shall not adversely affect the location identified or that the potential cultural resource suggested by the occurrence of the indicators, does not exist.
>
> c) A report of this investigation prepared by the marine survey archaeologist or underwater archaeologist shall be submitted to the DCM and the Manager, BLM OCS Office, for their review. Should the DCM determine that the existence of a cultural resource which may be

adversely affected by such operation is sufficiently established to warrant protection, the lessee shall take no action that may result in an adverse effect on such cultural resource until the DCM has given directions as to its preservation.

In addition, the lessee agrees that if any site, structure, or object of historical or archaeological significance should be discovered during the conduct of any operations on the lease area, he shall report immediately such findings to the DCM and make every reasonable effort to preserve and protect the cultural resource from damage until the DCM has given directions as to its preservation.

Evaluation of Effectiveness: OCS Order 2.1.3 requires the lessee to perform, on the well site, shallow geologic hazard surveys or other surveys are required by the DCM. No specific mention is made of cultural resource surveys. This measure applies specifically to cultural resources that my be present in the proposed sale area. Included in the measure are a list of blocks that have the highest probability of containing cultural resources, a procedure for the detection of such resources, and a requirement that if such resources are found that they be protected. This measure would minimize the possibility of damage to or destruction of cultural resources within the proposed sale area.

Orientation Program

There is concern that uninformed workers and subcontractors could unknowingly destroy or damage the environment, be insensitive to local historical or cultural values, biological resources, or unnecessarily disrupt the local economy. Due to the importance of subsistence, lifestyle, economics, and wildlife resources in the Norton Sound area, these issues would be covered in the proposed orientation program. These subjects have been identified in the scoping process as major concerns.

This potential mitigating measure would provide increased protection to the environment and addresses concerns of local residents. This program was implemented for the Trans-Alaska Pipeline, and in the lower Cook Inlet and Beaufort Sea OCS lease sale.

The lessee shall include in any exploration and development plans submitted under 30 CFR 250.34 a proposed environmental training program for all personnel involved in exploration or development activities (including personnel of the lessee's contractors and subcontractors) for review and approval by the DCM (Deputy Conservation Manager, Offshore Field Operations, Alaska Region, USGS). The program shall be designed to inform each person working on the project of specific types of environmental, social, and cultural concerns which relate to the individual's job. The program shall be formulated by qualified instructors experienced in each pertinent field of study, and shall employ effective methods to insure that personnel are informed of archaeological, geological, and biological resources including bird colonies and sea mammal haul-out areas, to insure the importance of avoidance and non-harassment of wildlife resources. The program shall also be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating.

The lessee shall also submit for review and approval a continuing technical environmental briefing program for supervisory and managerial personnel of the lessee and its agents, contractors, and subcontractors.

Evaluation of Effectiveness: This measure provides no direct prohibition of activities which may have cultural or social impacts on the area. It does provide a positive mitigating effect in that it makes the workers aware of the unique environmental, social, and cultural values of the local residents and their environment. This orientation program would promote an understanding of and appreciation for local community values, customs, and lifestyles of Alaskans without creating undue economic costs to the lessee. It would also provide necessary information to personnel which could result in minimized behavioral disturbance to wildlife.

The following measures were not unanimously agreed to at interagency coordination meetings held on February 27, March 13, May 8, December 7, 1981. and January 19, 1982. It was determined, however, to include these measures in the Environmental Impact Statement (EIS) for further consideration and analysis in the discussions on Effect of Additional Mitigating Measures within each impact assessment (Sec. IV).

Transportation of Hydrocarbon Products

This measure was adopted for OCS lease sales 42, 48, and 55 (open ocean areas). Citation of the Port and Tanker Safety Act of 1972, as amended (46 U.S.C. 391a), was added to the measure:

Pipelines will be required (a) if pipeline right-of-way can be determined and obtained; (b) if laying such pipelines is technically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to any recommendation of the intergovernmental planning program for assessment and management of transportation of OCS oil and gas with participation of Federal, State, and local government and industry.

All pipelines, including both flow lines and gathering lines for oil and gas, shall be designed and constructed to provide for adequate protection from water currents, storms and ice gouging, subfreezing conditions, and other hazards as determined on a case-by-case basis.

Following the development of sufficient pipeline capacity, no crude oil will be transported by surface vessel from offshore production sites, except in the case of emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the DCM.

Where the three criteria set forth in the first sentence of this stipulation are not met and surface transportation must be employed, all vessels used for carrying hydrocarbons to shore from the leased area will conform with all standards established for such vessels, pursuant to the Ports and Waterways Safety Act of 1972 (46 U.S.C. 391a), and the Port and Tanker Safety Act of 1972, as amended (33 USC 1221).

Evaluation of Effectiveness: The intent of this measure is to transport hydrocarbons by the environmentally preferable and safest method. The measure has been adopted for most recent lease sales. However, it has not yet been implemented for Alaska since there have been no commercial discoveries of oil or gas on the Alaska OCS.

This measure also recognizes recommendations of the Intergovernmental Planning Program (IPP), taking into account local land use planning, coastal management, environmental data gaps, local socioeconomic conditions, transportation, routing, and planning. This measure also recognizes the vulnerable coastline that surrounds Norton Sound. Although this measure requires pipelines, it allows flexibility for alternative methods of transportation of hydrocarbon products from the lease area, so long as such methods of transportation do not pose additional unacceptable risks to the human, marine, and coastal environments.

Seasonal Protection of Marine Mammals from Effects of Oilspills During Peak Migration Periods

It is the intent of this measure to provide additional, site-specific protection to minimize the possibility of oilspills impacting marine mammals, including endangered whales. It is believed that major populations of concern would be north of the Bering Strait or south of St. Lawrence Island during the period of drilling activity. The summer drilling period corresponds with comments received at the Norton Sound Synthesis Meeting (see Sec. I.A.6.).

The suggested measure reads as follows:

Exploratory drilling, testing, and other downhole exploratory activities on blocks Nos. 245, 288 through 291, 332 through 335, 375 through 380, 419 through 424, 464 through 468, 499, 510 through 512, 543 through 545, 554 through 557, 587 through 589, 597 through 601, 631 through 636, 640 through 647, 675, 676, 678 through 682, 684 through 691, 722 through 724, 728 through 735, 766 through 768, and 772 through 776, will be limited to the period June 1 through October 30, unless the DCM (Deputy Conservation Manager, Offshore Field Operations, Alaska Region, USGS) determines continued operation is necessary to prevent a loss of well control or to ensure human safety.

Evaluation of Effectiveness: The Secretary of Interior has the authority to reevaluate or terminate the measure (as may be needed) in response to additional studies information and technological progress. Figure II.B.1.c.-1 shows the area to which this measure applies (93 blocks). Present information shows that these 93 blocks are subject to the influence of different oceanographic conditions than the rest of the proposed area. These conditions

would lead to substantial transport of spilled oil in relatively short periods; and there would be little, if any, opportunities for controlling spilled hydrocarbons./ Also, results of the USGS Oilspill Risk Analysis (Appendix J) show that spill source points within the shaded area of Figure II.B.1.c.-1 have a higher probability of impacting areas south and west of the proposed lease area than other source points. For example, there is a 15- to 27-percent chance that spills originating at western points P1 and P2 would hit sea segment 31 (between St. Lawrence Island and the mainland). There is only a 5-percent chance associated with eastern source points P4, P5, and P6 (Appendix J, Table 6). Therefore, if a seasonal drilling restriction were adopted, it would be less likely that large numbers of non-endangered marine mammals which migrate or assemble in the immediate vicinity of westernmost tracts would be directly affected by oilspills. In the absence of such a measure, such impacts would be more likely.

In addition to protection of wildlife resources, the measure provides additional protection for subsistence resources. OCS Operating Orders or other mitigating measures, which could provide an equally effective means of protection for the wildlife in the area, are not yet available. However, USGS in its Environmental report criteria (Alaska OCS Region NTL 80-1) requires lessees to discuss subsistence uses in the area of their proposed oil and gas activities and to identify potential impacts of those activities on subsistence.

An environmental report must be submitted to USGS by lessees with each plan and this report is made available to the public for review. The DCM may receive advice from the National Marine Fisheries Service as to the applicability of this measure at the time of plan submission. See Section IV.B.2.d. for additional justification and discussion of the effectiveness of this measure.

Area of Special Concern

Results of the scoping process in the Norton Sound region indicate a concern about oilspills near the Yukon River Delta, the lack of availability of industry to respond to spill incidents and lack of local community control. The scoping process also resulted in the southern deletion (Alternative VI) near the Yukon River Delta (Fig. II.B.6.a.-1).

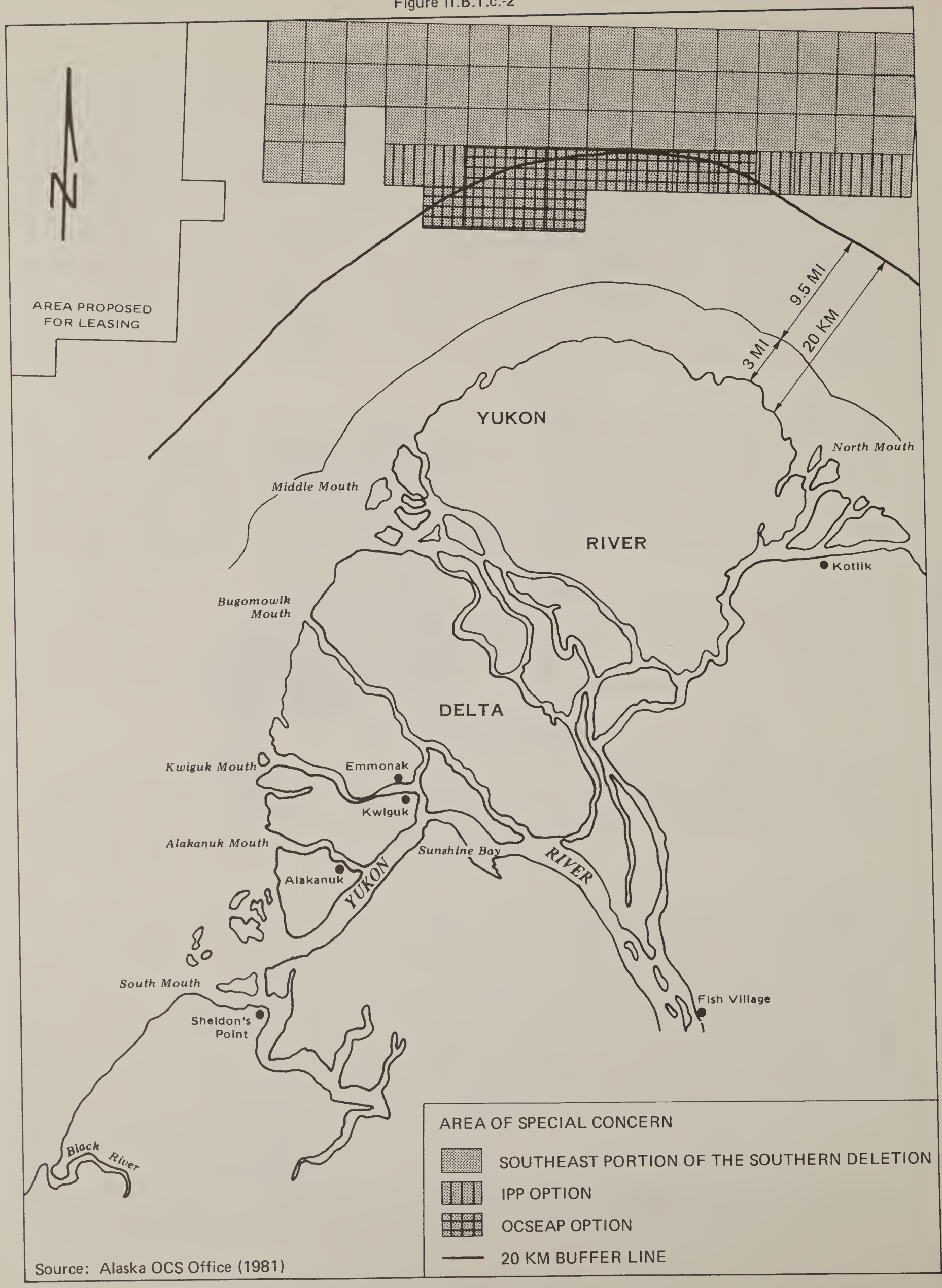
Results of the Norton Sound Synthesis Meeting (see Sec. I.A.6.) yielded similar concerns, i.e., the Yukon River Delta is a very important coastal habitat that could be severely impacted by oilspills, and the difficulty and consequences of cleaning up an oilspill that could reach the sensitive Delta and associated wetlands. [For example, informed shoreline specialists like Miles Hayes (also referenced in Appendix K) stated that oilspills are very difficult to remove from marsh sediments, and that transportation of cleanup equipment on the marsh could be more damaging than no cleanup efforts at all.] The Norton Sound Synthesis Meeting group concluded that there should be a deletion of any blocks within 20 kilometers of the delta shoreline or any defined Yukon River and sub-ice channels offshore. (The 20-kilometer buffer intersects 11 blocks as shown in Fig. II.B.1.c.-2.)

The IPP's Regional Technical Working Group (RTWG) also suggested that the 17 blocks nearest the Yukon River Delta should be deleted to help protect the river's resources (Fig. II.B.1.c.-2).

Figure II.B.1.c.-1

Source: Alaska OCS Office (1981)

Figure II.B.1.c.-2



Source: Alaska OCS Office (1981)

Both options suggested above consist of blocks that are a part of the southern deletion proposed in the scoping process (Alternative VI). Assessments are included within that alternative.

The USGS Oilspill Risk Analysis for Norton Sound shows that there is a low oilspill risk to the Delta during the summer there is only an 11-percent risk of a 1,000 barrel spill reaching the Delta within 10 days (Appendix J, Table 7). Additionally, if a spill does occur from a point in these blocks (Fig. II.B.1.c.-2), the probability could be as high as 22-percent (Appendix J, Table 2) that oil would contact the Delta within 10 days. Spill points located in other blocks would not pose as great a threat (in most cases less than a 0.5-percent risk). Since transfer of spilled oil from storage to tanker presents the greatest potential for spill occurrence, the proposed stipulation reduces the risk by prohibiting the activity in areas (65 blocks) near the Delta.

The DCM may consult with the FWS on changes in this measure. FWS is the agency with jurisdiction of the Clarence Rhodes National Wildlife Refuge on the Yukon Delta.

The suggested lease stipulation reads as follows:

> Loading produced oil, except during testing for well producibility, is prohibited on block numbers 398 through 413, 442 through 456, 486, 487, 489 through 501, 530, 531, 533 through 545, and 578 through 581. Separation, treatment, storage, and piping of produced oil at the point of production is not precluded if the DCM finds that such activities can be safely accomplished, giving due recognition to the potential hazards of oilspills to the Yukon River Delta.

Evaluation of Effectiveness: Certain petroleum facilities do not have to be located in this region, although drilling platforms and possibly pipelines need to be located there to explore the region and produce potential petroleum resources. However, non-site-specific facilities, such as loading terminals and tankers, could be located in areas that pose less risk to the Delta. Since the non-site-specific facilities pose a much greater oilspill risk than site-specific facilities such as pipelines and offshore platforms, prohibition of these facilities greatly reduce the risk. The above measure for special industry operating conditions is designed to make it as safe to lease the 65 blocks near the Yukon River Delta as it is to lease any other blocks in the sale area. The wording of this measure has been modified slightly based on comments received on the DEIS.

The stipulation is designed so that it is not excessively restrictive, relative to the benefits, and may be modified upon agreement of both parties. The stipulation does not apply to gas, since resource estimates indicate that gas is the only type of petroleum hydrocarbon in the southern tracts. [This is evident by comparison of the resource estimates for both oil and gas for the proposal (Sec. II.B.1.a.) and for the southern deletion (Sec. II.B.6.a.).] Given the resource estimates, if gas is discovered, the stipulation will not be restrictive and the environmental risk will be low, because spills of gas evaporate almost immediately. On the other hand, if oil happens to be discovered near the Yukon River Delta, oilspills may occur then and the risk of hazardous oilspills will be higher than estimated in Appendix J. In other

words, the measure is more restrictive and the benefits of the stipulation will also be higher than estimated.

The Secretary of Interior has the authority to reevaluate or terminate this measure (as may be needed) in response to new information.

Information to Lessees: The following suggested measures are being considered for inclusion in the Information to Lessees. They are advisory in nature and provide a notice to operators of special concerns in or near the lease area. They were agreed to at the field level interagency coordination meetings held on February 13, March 13, November 30, December 7, 1981, and January 19, 1982.

Information on Bird and Marine Mammal Protection

Bidders are advised that during the conduct of all activities related to leases issued as a result of this lease sale, the lessee and its agents, contractors, and subcontractors will be subject to the provisions of the Marine Mammal Protection Act of 1972; the Endangered Species Act of 1973, as amended; and International Treaties.

The lessee or its contractors should be aware that disturbance of wildlife could constitute harassment and could thereby be in violation of existing laws. Violations of these Acts and Treaties may be reported to the National Marine Fisheries Service or U.S. Fish and Wildlife Service, as appropriate. Behavioral disturbance of most birds and mammals found in or near the proposed sale 57 area would be unlikely if ocean vessels and aircraft maintained at least a 1-mile distance from observed wildlife or known wildlife concentration areas such as bird colonies, marine mammal haul-out areas, and peregrine falcon nests. Therefore, in concurrence with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, it is recommended that aircraft or vessels operated by lessees maintain at least a 1-mile distance from observed or known wildlife concentration areas. Human safety will take precedence at all times over these provisions. Maps locating major wildlife concentration areas are available for route planning through the DCM (Deputy Conservation Manager, Offshore Field Operations, Alaska Region, USGS), and appropriate resource agencies.

Evaluation of Effectiveness: Conformance by lessees with the recommendations described above would help to ensure that behavioral disturbance of wildlife, particularly at known concentration areas, is minimized. Maps provided to the DCM will clearly designate locations habitually used as concentration areas. Tract-specific recommendations may be made by the DCM, as appropriate. Appropriate authorities may issue more specific regulations under existing legislation that could further minimize behavioral disturbance to wildlife. In addition to protection resulting from the above, many of these species provide important food supplies for most of the population in the Norton Sound area.

Information on Fairway Designations

Some of the tracts offered for lease may fall in areas which may be included in fairways, precautionary zones, or traffic separation schemes which may be established, among other reasons, to protect maritime commerce. Bidders are advised that the United States reserves the right to designate necessary fairways through leased tracts pursuant to the Port and Tanker Safety Act of 1972, as amended.

Evaluation of Effectiveness: The above measure was suggested by the U.S. Coast Guard during the scoping process for Norton Sound. Coast Guard designation of fairways would aid in the protection of maritime commerce through the avoidance of vessel routing conflicts and collisions.

Information on Iditarod National Historic Trail

Portions of the Iditarod Trail, from Kaltag to Nome, following along Norton Sound and crossing the ice between Shaktoolik and Bald Head and between Ungalik and Bald Head, are managed by the Bureau of Land Management, Department of Interior, under:

(1) the National Trails System Act, as amended (16 U.S.C. 1241 et seq.);

(2) the National Historic Preservation Act, as amended (16 U.S.C. 470 et seq.);

(3) the Historic Sites Act of 1935 (16 U.S.C. 461 et seq.);

(4) the Antiquities Act of 1906 (16 U.S.C. 431-433); and,

(5) other state and federal laws.

The management and protection of the Historic Trail is subject to these laws.

Evaluation of Effectiveness: The National Trails System Act, as amended, establishes the Iditarod as a National Historic Trail of approximately 2,000 miles which extends from Seward to Nome, Alaska. Although well known to many Alaskans, it is believed that the above Information to Lessees is necessary to advise contractors, subcontractors, and other oil-related interests, (particularly those from outside the state) of its existence and proximal location to the proposed lease sale area.

Information on Subsistence Activities

Lessees are advised that oil and gas exploration and production operations should be conducted so as to minimize interference with subsistence harvests.

Evaluation of Effectiveness: The above measure serves to inform operators of the special concern that residents in the Norton Sound area have for subsistence activities and thereby reduces the probability of adverse impacts. Subsistence and maintenance of lifestyle for the people of Norton Sound are major issues of concern (see Sec. I.F. and V.B. and Appendix H on the scoping

process for Norton Sound). Dependence on subsistence and village living are predominant ways of life in the area. Disturbance of subsistence-harvest activities could seriously disrupt the lifestyle, culture, and social organization of villages in the Norton Sound area. Sections 101 and 102 of the Outer Continental Shelf Lands Act, as amended, require the federal government to minimize or eliminate any conflicts between oil and gas activities and other uses of the marine environment.

Information on Oilspill Contingency Plans

> Lessees are advised that Geological Survey's review of oilspill contingency plans required under 30 CFR 250-34.1 for block nos 398 through 413, 447 through 456, 486, 487, 489 through 501, 530, 531, 533 through 545, and 578 through 581 may result in the requirement of special measures to protect the biological resources and associated subsistence values of the Yukon Delta.

Evaluation of Effectiveness: This measure is designed to inform the oil industry that mitigation may be necessary on 65 blocks to protect the biological resources which are essential to the people of the Yukon Delta for subsistence activities. The area of concern is shown in Figure II.B.1.c.-2.

d. Other Mitigating Measures Beyond DOI Authority: CEQ regulations implementing NEPA require lead agencies to consider mitigating measures beyond the authority of both the lead and cooperating agencies (40 CFR 502.16(h), 1505.2(c); clarified at 46 FR 18031-18032). Other mitigating measures comprise potential regulations, projects, plans, and operating practices which may function as mitigating measures in the context of this EIS. These measures are beyond the authority of the Department of the Interior. As such, the source of authority for these measures should be distinguished from Sections I.C., I.D., II.B.1.b., and II.B.1.c., which pertain to existing federal authorities, existing DOI mitigating measures, and DOI sale-specific mitigating measures.

The measures listed in the following have been identified in specific sections of this EIS as having potential mitigating impact upon this leasing proposal. The analysis of environmental consequences of this proposal (Sec. IV) does not assume the presence and application of other mitigating measures. However, under the Effect of Additional Mitigating Measures subheadings in each part of Section IV, the availability and effectiveness of other potential mitigating measures are considered in the context of any potentially significant environmental effects (Sec. II.B.1.c.).

Measures Outside Department of Interior Authority Intended to Mitigate Transportation Systems Impacts: (a) Construction and operation of the Nome deepwater terminal, including separate berthing space between deep draft and other vessels; (b) Installations and improvements to the Nome airport and terminal recommended by FAA in its Alaska 10-year improvement plan (FAA, 1979); (c) Construction and dedication of a bypass route(s) to the port of Nome and the Nome airport to accommodate heavy vehicle traffic to and from the Cape Nome OCS onshore facilities; (d) Siting of a temporary pipe coating yard at the Cape Nome onshore facility; (e) Use of anchored barges as floating warehouses and contract lighterage service from the port of Nome during the period of OCS operations prior to completion of the proposed Nome deepwater terminal (EIS

scenario assumption); and (f) Utilization of offshore instead of onshore borrow extraction sources if artificial island platforms are to be used by OCS operators (EIS scenario assumption).

Measures Outside Department of Interior Authority Intended to Mitigate Visual, Wilderness, and Recreational Resources Impacts: (a) Development of OCS onshore facilities at Cape Nome (EIS scenario assumption) or some location between Nome and Cape Nome; (b) Application of an enclave operation through

Alaska Coastal Management Program planning policies and/or private leasehold and contractual restrictions; (c) Annexation and taxation of onshore OCS facilities by the city of Nome, to include the facilities within the city planning boundaries and to provide funds for defraying costs of infrastructure improvements and supplementary recreational facilities; (d) Implementation of a comprehensive plan for the Iditarod National Historic Trail, including designation and protection of a commemorative right-of-way through acquisition of easements and right-of-way agreements; (e) Selection of OCS onshore facility sites which do not interfere with the Iditarod Trail commemorative route and historic sites protected under the National Register of Historic Places; (f) Use of construction practices which avoid or minimize interference with the Iditarod Trail and protected sites; and (g) Application of site planning practices which avoid or minimize visual impact of OCS facilities upon the recreational and historic character of the Iditarod Trail and protected sites.

Coastal Zone Management: (a) Development of OCS onshore facilities at Cape Nome (EIS scenario assumption) or some location between Nome and Cape Nome; and (b) Application of an enclave operation to Alaska Coastal Management Program planning policies and/or private leasehold and contractual restrictions.

See Section IV.H. for a discussion of the effectiveness of other mitigating measures described above. Refer to Appendix B for a discussion of the enclave concept and an evaluation of its effectiveness as a mitigating measure.

e. Summary of Probable Impacts: The probable impacts are based in part on the assumption that the mean resource estimate of 480 million barrels of oil would be discovered and produced in the proposed lease sale area. For this amount of oil, according to the USGS, 2.8 or about 3 oilspills exceeding 1000 barrels are probable over the 20-year production life of the oil field (Table IV.A.4.b.-1). There is only a 14-percent chance that commercial quantities of oil would be found or, in other words, an 86-percent chance of not finding oil. If no oil is discovered, of course, there is no risk from potential oilspills.

The following discussion assumes that all laws, regulations, and orders, are in place and are part of the proposal. If the mitigating measures described in Sections II.B.1.c. and d. were adopted, it is expected that some impacts described in this environmental impact statement would be reduced. Potential effectiveness of the mitigating measures is described in Section II.B.1.c. and in each impact section of chapter IV.

Assuming discovery of the mean estimate of oil and natural gas, the proposed sale would result in a highly significant increase in total employment in the Nome census division. Additional employment directly related to petroleum

activities will first occur in 1983 and is expected to peak in 1988 at 3,258 jobs. This number exceeds the current employment total for the Nome census division. However, most of the petroleum-related jobs are expected to be filled by non-resident commuters who will be housed in isolated dormitories during work periods and fly out of the Nome area during frequent rest periods. It is assumed that approximately 10 percent of the petroleum-related jobs will be held by new residents of the area (i.e., non-commuters) and by long-term residents. Based on this assumption, very significant increases in resident population are projected, as well as significant increases in employment only indirectly related to petroleum activities. The indirect employment impacts would include new jobs in retail trade and services, air transportation, and local government.

The direct and indirect employment impacts could benefit residents of the Nome census division through an increase in jobholding by long-term residents of the area. On the other hand, however, it is very probable that a severe housing shortage will develop in the immediate Nome area unless local and state government, the oil industry and local private businesses take appropriate planning steps. In addition, the rates of price inflation in the city of Nome are very likely to increase during the rapid employment increase projected for the years 1983-1988. Inflationary effects will probably be greatest for housing costs and prices charged by hotels, restaurants, and bars. The degree of travel to Nome from the onshore enclave during the off-hours will influence the number of additional jobs created by the indirect effects of petroleum activity and thereby affect the population and inflation impacts. The more money petroleum workers spend in Nome, the greater the employment and population impacts will be. If the proposed sale resulted in the local production and sale of natural gas and heating oil, the inflationary aspects of rising energy costs could be significantly reduced throughout the area.

Due to their relatively small size, villages closest to Nome are probably the most vulnerable should the proposed lease sale occur. Inflation of prices in Nome would affect prices of goods brought from Nome. These include critically needed items such as fuel, fishing, and hunting supplies essential for subsistence activities. For villages more distant from Nome, it is likely that few changes directly related to the proposed action would occur, except insofar as subsistence resources are affected. Positive benefits to these villages would be greatest if a few residents sought work with industry or related activities, and if this cash were returned to the village to improve subsistence technology.

The demographic structure (age, sex, ethnic ratio) of the Nome community could be expected to change significantly. Because of the population increase and shift in ethnic ratio, the Nome community would probably take on a less personal character. In addition, stress related to increased economic stratification, social competition, and increased alcohol and drug use would result in a decline in overall family solidarity for both Natives and non-Natives. Native families who have recently moved to Nome come from villages and have fewer adaptive skills for coping with town life would be most vulnerable.

Subsistence activities throughout the lease sale area are the center of village ways of life, passed on through countless generations. Disturbances to harvests, harvest activities, or to village economic and social systems which support the subsistence way of life could singly or collectively create hard-

ship and stress to affected villages throughout the lease sale area. Competition and conflict between sport and subsistence users of fish and game could be significant, primarily during the proposed onshore development period (1981-1991). Villages most likely to be affected by an oilspill would include various Eskimo communities within Nome including King Islanders, Diomede Islanders, and St. Lawrence Islanders dependent upon walrus, bowhead, gray, minke, and beluga whales, ringed, bearded, and spotted seals for subsistence.

Other villages outside the Nome area which could be affected by oilspill events would include Gambell, Savoonga, and Diomede. Of these, Savoonga is the closest village to a high oilspill risk area, as defined by the Oilspill Risk Analysis.

Secondary effects resulting from potential oilspill events include the psychological stress caused by fear of oilspill pollution which is now widespread throughout the lease sale area. Significant and meaningful village participation in oilspill contingency planning could mitigate against some fo these fears and concerns. Other potentially significant secondary effects on subsistence include inflationary costs of goods and services purchased through Nome, indirect effects on fishing village economies, particularly in the inner Norton Sound and Yukon Delta in the event of a major oilspill, and fluctuations in bird and marine mammal migration patterns which increase travel time and expense for subsistence harvests. Federal budget cuts which affect local village economies would increase dependence on subsistence foods while at the same time increasing the stress felt from even minor fluctuations in subsistence harvest outcomes.

The major impact on demersal finfish, forage fish, salmon, and king crab from a major oilspill would be mainly to the egg and larval stages. These species would be most vulnerable during spawning and early development in the spring and summer, and an oilspill could cause a temporary short-term population reduction. Salmonid populations would be subject to some adverse impacts to both the adult and the out-migrating smolt. Improper design and siting of onshore facilities could alter water quality and interfere with migration, although resource agency review of permit applications would alleviate these impacts.

Most of the more than 5-million seabirds found in the northern Bering Sea nest and forage far west of the proposed sale area and in the Chirikov Basin, and they are unlikely to be affected by potential oilspills in the sale area or at the proposed tanker facility at Cape Nome. For the approximate 24-million waterfowl and shorebirds that occur in Norton Sound, the greatest risks would come from oilspills that may reach the intertidal habitats of the Yukon River Delta. Should a major oilspill impact the delta, moderate to severe local impacts to seabird populations are likely to occur. If a large oilspill contaminated a large portion of the Yukon River Delta intertidal area, major significant regional impacts to waterfowl and shorebirds are likely to occur and could have national and international significance. However, the oilspill risk analysis (Sec. IV.A.4.) indicates that it is unlikely that this would occur. Should a spill contact the Yukon River Delta, it may be impractical to clean up the spilled oil; and its natural persistence and effect on resident birds and fish may last many years.

Coastal areas of Norton Sound occupied seasonally by spotted seals, walrus, and ringed seals are at low level of risk from potential oilspills (see Sec. IV.A.4.c.). Marine mammal coastal habitats under greatest risk of contact are the eastern coast of St. Lawrence Island and the Punuk Islands. The relatively high probability of oilspills moving into offshore areas immediately west of the proposed sale area suggests that if spills occurred during periods of peak spring and fall migrations, substantial adverse effects on populations of walrus, bearded seal, spotted seal, and beluga whale are possible. Given the assumed rate of oilspills associated with the proposed sale area, however, substantial adverse effects on these migrating marine mammals are unlikely.

Endangered whale species could be adversely affected by disturbance, especially species such as the bowhead whale which have a low tolerance to human activity. Temporary avoidance of offshore areas could also be expected of gray whales. Benthic food resources used by gray whales could be significantly altered by oilspills. (See Sec. IV.B.2.e.) Significant direct impacts on peregrine falcons due to oilspills are unlikely.

2. Alternative II - No Sale:

a. Description of the Alternative: This alternative removes the total area for proposed leasing from further consideration.

b. Summary of Probable Impacts: Alternative II would eliminate those impacts described in the proposal. The cancellation of proposed sale 57 could pose potentially adverse impacts on the national economy by continuing increased dependence on imported oil and gas. Impacts could occur as a result of development of alternative energy sources. Refer to the FEIS for the proposed 5-year oil and gas lease sale schedule and the FEIS for OCS sale 55, Eastern Gulf of Alaska (DOI, 1980), and Appendix H of the sale 70 DEIS for a general discussion of the potential impacts that could result from various alternative energy sources. Alternative II would also eliminate any adverse impacts attributable to the proposal.

3. Alternative III - Delay the Sale:

a. Description of the Alternative: This alternative would delay the start of the proposal as previously described in Section II.B.1.a. for a 3-year period. (Refer to Sections I.F. and V.B. and Appendix H for discussions of the delay times suggested in the scoping process.)

b. Summary of Probable Impacts: Alternative III would delay potential impacts of the proposal and possibly reduce them but would not avoid them. A reduction in biological and social impacts by some unquantifiable degree could be achieved if the delay were used to strategically plan for community impacts on the Nome area and to fill biological data gaps, especially with regard to birds and marine mammals. These studies could help to better understand potential impacts on the biological resources of Norton Sound and could provide additional information to more effectively mitigate potential impacts.

4. Alternative IV - Northern Deletion: Modification of the proposal by deleting 121 blocks located in the northern portion of the proposed sale area.

a. Description of the Alternative: This alternative involves the leasing of 308 blocks within Norton Sound (Fig. II.B.4.a.-1). The blocks suggested for leasing under this alternative comprise an area of about 709,632 hectares (1,753,500 acres). The blocks are located approximately 14 to 99 kilometers (9 to 62 mi) offshore in water depths of 5 to 27 meters (16 to 89 ft). See Appendix A for size, distance from shore, and water depth of each individual block.

According to known geophysical data, the Geological Survey, based on unrisked statistical estimates, projects that the 308 blocks offered in this alternative may contain commercial resources amounting to 260 MMbbls of oil and 1.6 tcf of natural gas. The deletion of the northern blocks would result in a reduction of the estimated recoverable resources by some 220 MMbbls of oil and 410 bcf of gas from that of the proposal.

Exploration is hypothesized to begin in 1983 and continue through 1987 with a total of 30 exploration and delineation wells drilled. No more than 4 rigs will be assumed to be in operation during any year of the exploratory period.

If recoverable hydrocarbons are located, pipeline construction could begin in 1987 and end in 1988 with about 267 kilometers (166 mi) of parallel oil and gas pipeline in place (267 kms for each pipeline system). All pipe in place is expected to be laid under water, except for the final few kilometers. The pipelines are expected to landfall at a terminal processing complex located near Cape Nome.

Oil and gas production could begin by 1988. By that year, 3 production platforms would be in place. By 1991, some 103 production and service wells would be drilled. Oil production would cease in 2008 (26 years after the sale date), and gas production would end in 2019 (37 years after the sale date).

The exploratory, developmental, and transportation infrastructure scenario hypothesized to develop the resources for this alternative is not significantly different from that of the proposed action. For a brief discussion, see Sections II.A. and IV.A.1. through 3. An expanded treatment of this subject is contained in Alaska OCS Technical Paper No. 1.

b. Summary of Probable Impacts: The probable impacts are based on the assumption that 260 million barrels of oil would be discovered. According to USGS, for this amount of oil, 1.50 or about 2 oilspills greater than 1,000 barrels could be expected over the 19-year production life of the oil field. This represents a 46-percent decrease in the number of oilspills over that of the proposal and a 46-percent decrease in the expected production of recoverable resources (Table IV.A.4.-1). Potential risk to land segments would be reduced about 40 percent.

Alternative IV would delete 121 blocks from the proposed sale area in the northern portion of Norton Sound. While this alternative would not significantly reduce major potential impacts on the human and biological resources of the Sound, some reductions in potential risk from oilspills could be expected for the northern coast of Norton Sound. The major reduction in potential risk due to an oilspill would be to the eastern coast of St. Lawrence Island, which would be reduced from a high to moderate level of potential impact. The deletion of the northern blocks would lower the sociocultural impacts

Figure II.B.4.a. –1

Source: Alaska OCS Office (1981)

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moderately; but it would not affect the location of an enclave at Cape Nome and the impacts associated with such an enclave. The total number of additional jobs created in the Nome area by this alternative, including jobs held by nonresident commuters, would peak at about half the number created by the proposal. The increase in resident population would peak at about 37 percent of the population impact of the proposal. Commercial fisheries resources and potential subsistence fishing impacts would be moderately reduced as a result of this action. There would be a noticeable reduction in risks to some seabirds and their foraging habitats; however, most of the risks come from the potential tanker facility pipelines to Cape Nome. These risks are similar to the proposal. The overall potential impacts to marine mammals and endangered species would probably not be significantly different from those associated with the proposal.

Deletion of the northern blocks would moderately lower the sociocultural impacts discussed in the proposal because of these blocks that would be deleted close to Nome. This deletion does not affect the potential location of an enclave at Cape Nome and the associated impacts.

The direct employment impacts of this alternative would peak at 1,742 jobs in the Nome Census Division, or only 53 percent of the direct employment peak impact of 3,258 new jobs expected to result from the proposal. These figures include large numbers of jobs held by nonresidents of the census division, who would commute to residences in other parts of Alaska or out of state during rest periods.

Population projections over the expected life of the field would be modified significantly, requiring fewer additional new houses. Inflated housing costs and probable inability to provide public utilities to many new housing units could be expected with this alternative. Without additional state or federal aid, Nome would probably not be able to finance the increased public services demanded.

Deletion of the northern blocks would moderately reduce risk to commercial fishery resources. Additionally potential subsistence fishing impacts would be moderated slightly but would still remain high.

During the summer, there would be a noticeable reduction in risk to seabirds (and their foraging habitat) of the bluff and adjacent colonies. Sledge Island seabird foraging shows a substantial reduction in potential risk from a possible oilspill; however, most of the risks to the targets come from the possible tanker facility pipelines to Cape Nome. These risks are similar to those of the proposal.

The overall impacts on marine mammals and endangered species would probably not be significantly different from those associated with the proposal.

The cumulative effects which could result from this alternative and other major impacts (Sec. IV.A.8.) would be similar in nature to, but more extensive than, the impacts which have been described above. However, they would be less than the proposal.

5. Alternative V - Eastern Deletion: Modification of the proposed sale area by deleting of 181 blocks located in the eastern portion of Norton Sound.

a. Description of the Alternative: This alternative involves the leasing of 248 blocks located within the Norton Sound area (Fig. II.B.5.a.-1). The blocks suggested for leasing under this alternative comprise an area of about 571,392 hectares (1,411,910 acres). The blocks are located approximately 27 to 99 kilometers (17 to 61.5 mi) offshore in water depths of 8 to 27 meters (26 to 88.5 ft). See Appendix A for size, distance from shore, and water depth for each block.

According to the known geophysical data, Geological Survey, based on unrisked statistical estimates, projects that the 248 blocks offered in this alternative may contain commercial resources amounting to 90 MMbbls of oil and 1.560 tcf of natural gas. The deletion of eastern blocks would reduce the estimated recoverable resources by some 390 MMbbls of oil and 440 bcf of gas below those of the proposal.

Exploration is hypothesized to begin in 1983 and continue through 1987 with a total of 25 exploration and delineation wells drilled. No more than 3 drilling rigs would be assumed to be working during any year of the exploratory period.

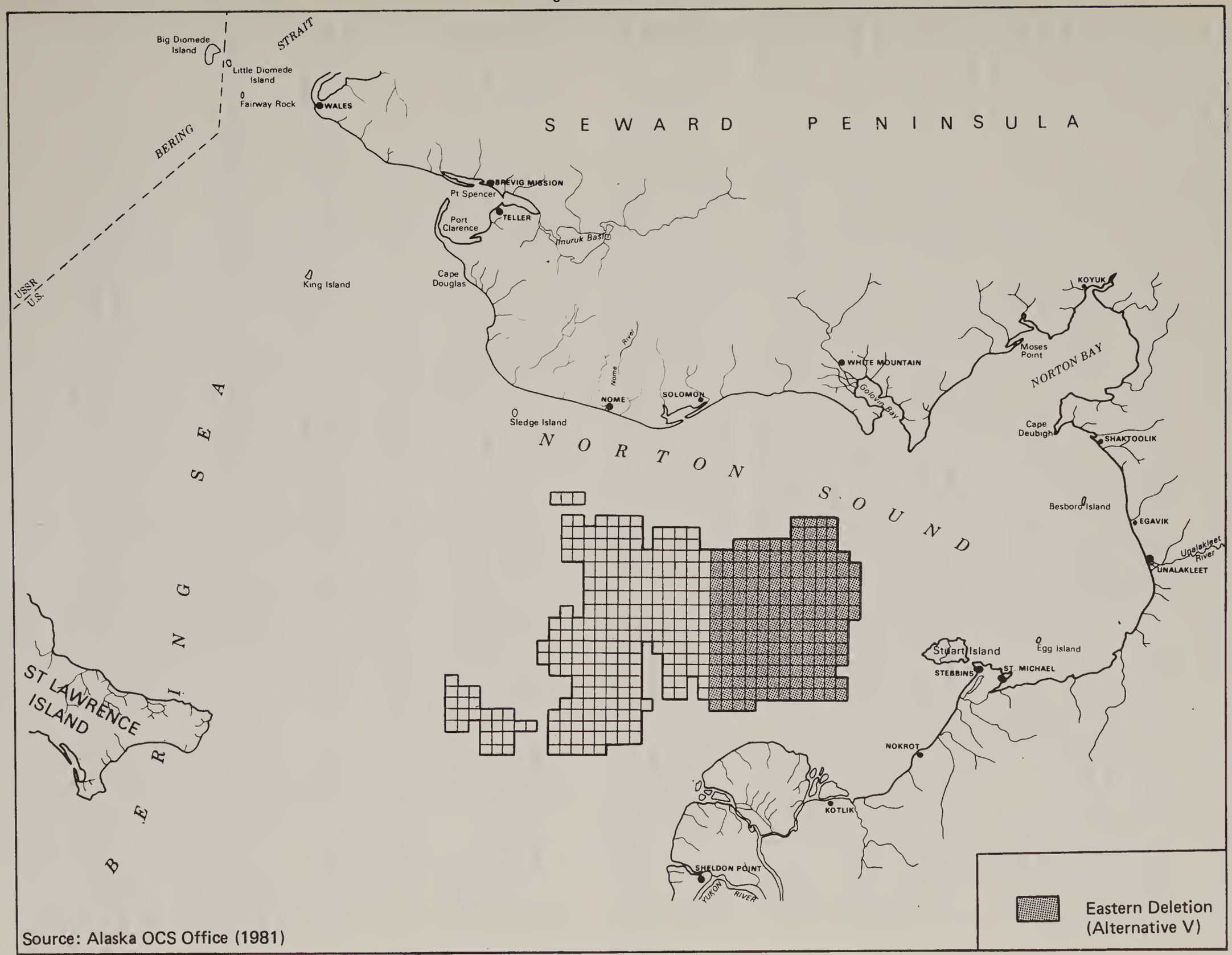
Pipeline construction would begin in 1987 and end in 1988. One oil and one gas pipeline system would be in place. The pipelines would be constructed parallel to each other and should equal some 232 kilometers (144 mi) each. The entire length of the system, save for the final few kilometers, is expected to be laid under water. The pipelines are expected to landfall at a processing/terminal complex near Cape Nome where the hydrocarbons would be treated and stored for shipment to market. However, given the resource for this alternative, it may be more realistic to assume a scenario in which produced hydrocarbons could be processed and loaded offshore from large steel gravity platforms or artificial islands (see Section II.A.).

Oil and gas production could begin in 1988, with two production platforms installed. By 1991, some 51 production and service wells would be drilled. Oil production would cease in 2007 (25 years after the sale date), with gas production terminating by 2019 (37 years after the sale date).

The exploratory, developmental, and transportation infrastructure scenario hypothesized to develop the resources for this alternative is not significantly different from that of the proposed action. For a brief discussion, see Sections II.A. and IV.A.1. through 3. An expanded treatment of this issue is contained in Alaska OCS Technical Paper No. 1.

b. Summary of Probable Impacts: The probable impacts are based on the assumption that 90 MMbbls of oil would be discovered. For this amount of oil, 0.56 or about 1 oilspill greater than 1,000 barrels could be expected over the 20-year production life of the oil field. This represents an 80 percent decrease in the expected number of oilspills greater than 1,000 barrels from that of the proposal and an 80 percent decrease in expected resource recovery (Table IV.A.4.-1). Potential risks to land segments would be reduced about 90 percent.

Figure II.B.5.a.–1



Source: Alaska OCS Office (1981)

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Alternative V would delete 181 blocks in the eastern half of the proposed sale area. This alternative would significantly reduce major potential impacts on the human and biological resources of the Norton Sound area. Given the significantly reduced resource estimates, offshore loading of oil and gas is assumed for this alternative. Total employment impacts, including jobs held by nonresident commuters, would peak at about 29 percent of the employment impact of the proposal, and the increase in resident population would peak at only 13 percent of that of the proposal. Since all OCS support would be totally or substantially enclaved, onshore major impacts on local population would be significantly reduced. Some potential reductions in risk from oilspills could be expected within Norton Sound. These reductions and would be expected to occur primarily for the northern coast of Norton Sound, as well as portions of the Yukon Delta and Stuart Island. However, these areas are of a low potential risk even with the proposed action. The eastern coast of St. Lawrence Island would be significantly reduced in potential risk to an oilspill from a high to a low potential risk factor. This alternative should significantly reduce potential risk to birds and their habitats along the Seward Peninsula and Yukon River Delta. Similar reductions in the potential impacts could be expected for marine mammals and endangered species. Overall disturbance and potential impacts could be significantly reduced, especially in the inner Norton Sound area, due to the reduced level of activities associated with this alternative.

Direct employment impacts of this alternative would peak at 1,097 a total of 1,289 additional jobs in the Nome Census Division, or only 34 percent of the direct employment impact peak of 3,258 new jobs expected to result from the proposal. These figures include large numbers of jobs held by nonresidents of the census division who would commute to residences in other parts of Alaska or out of state during rest periods.

This alternative reduces by over 50 percent the levels of peak population impacts projected under the proposal. Since offshore loading of oil and gas are assumed for this alternative, the anticipated onshore impacts such as facility siting and population under the proposal would be significantly reduced. Since all OCS support could be totally or substantially enclaved offshore, only the Nome airport and other transportation points would be the major point of interaction with local populations. The impacts on the Nome population would be almost completely eliminated with this alternative.

Potential impacts to birds and their habitat along the Seward Peninsula and Yukon River Delta could be substantially reduced with this alternative compared to the proposal. Similar reduction in potential impacts could be expected for marine mammals and endangered species frequenting offshore environments of Norton Sound and the northern Bering Sea, as well as walrus habitats along eastern St. Lawrence Island. Due to the reduced level of activities associated with this alternative, overall disturbance and potential impacts would be reduced, especially in inner Norton Sound.

Cumulative effects which would result from this alternative and other major projects (Sec. IV.A.8.) would be similar to, but more extensive than, the impacts which have been described above. However, they would be significantly less than the proposal because of the expected reduced resource recovery and offshore loading.

6. Alternative VI - Southern Deletion: Modification of the proposed sale area by deleting 157 blocks in the southern portion of Norton Sound.

a. Description of the Alternative: The alternative involves the leasing of 272 blocks located entirely within Norton Sound (Fig. II.B.6.a.-1). The blocks suggested for leasing under this alternative comprise an area of about 626,688 hectares (1,548,546 acres). The blocks are located approximately 34 to 88 kilometers (21 to 55 mi) offshore in water depths of 11 to 25 meters (36 to 82 ft). See Appendix A for size, distance from shore, and water depth for each block.

Acccording to known geophysical data, Geological Survey, based on unrisked statistical estimates, projects that the 272 blocks offered in this alternative may contain commercial resources amounting to 480 MMbbls of oil and 1.740 tcf of gas. Deletion of the southern blocks would result in no reduction in estimated recoverable oil resources but a 270 bcf reduction in natural gas reserves from that of the proposed action.

Exploration is hypothesized to begin in 1983 and continue through 1987 with a total of 45 exploration and delineation wells drilled. No more than 5 rigs would be assumed to be in operation during any year of the exploratory period.

Pipeline construction would begin in 1987 and end in 1988. One oil and one gas pipeline would be in place. The pipelines would be constructed parallel to each other and should equal 232 kilometers (162 mi) each. The entire length of the systems, except for the final few kilometers, is expected to be laid under water. The pipelines would be expected to landfall at a terminal/processing facility located near Cape Nome. At that point, the hydrocarbons would be treated, stored, and eventually transported to market.

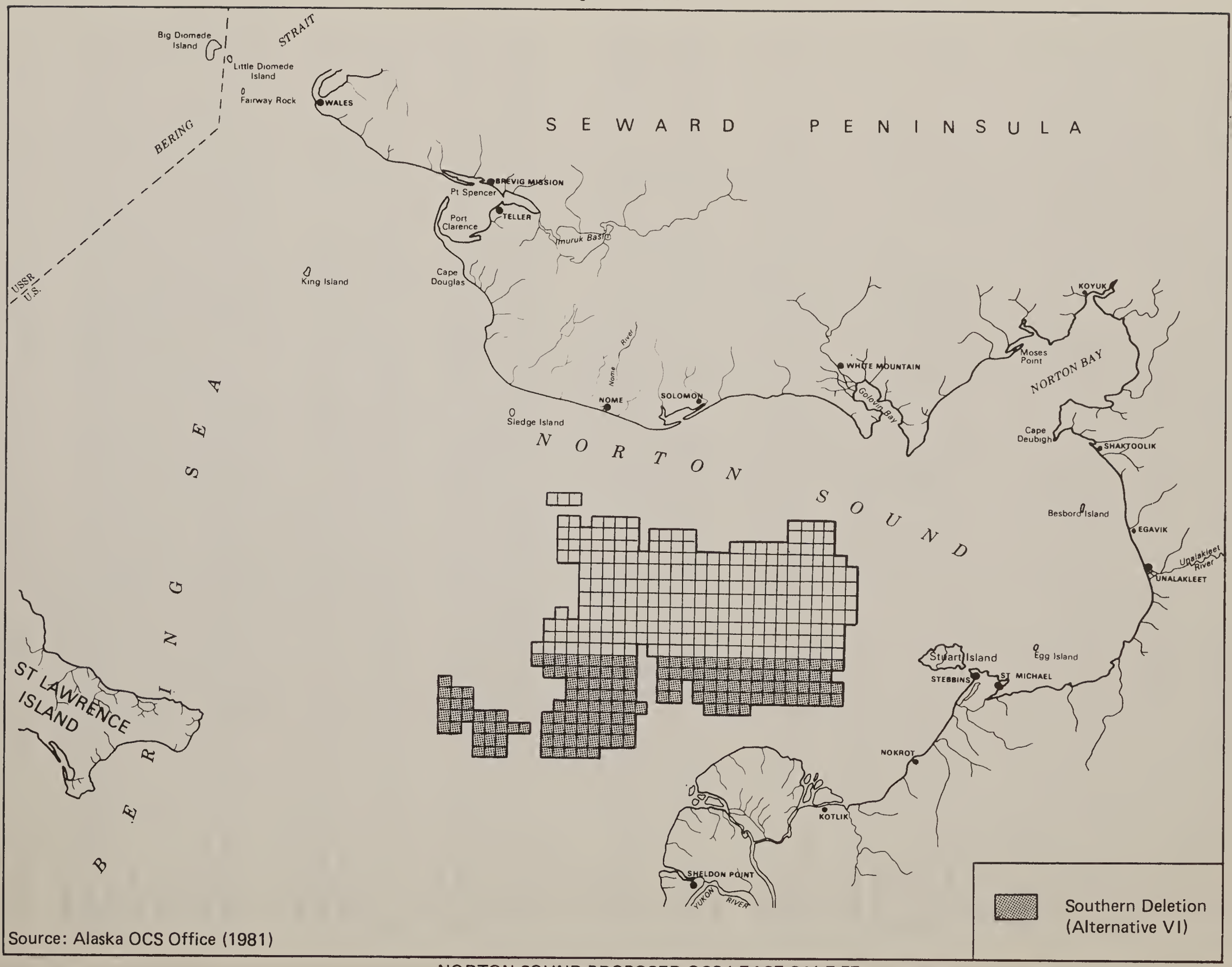
Oil and gas production could begin in 1988. By that year, seven production platforms could be installed. By 1991, some 168 production and service wells may be drilled. Oil production is expected to cease by 2008 (26 years after the sale date), while gas production should continue to 2019 (37 years after the sale date).

The exploratory, developmental, and transportation infrastructure scenario hypothesized to develop the resources for this alternative is not significantly different from that of the proposed action. For a brief discussion, see Sections II.A. and IV.A.1. through 3. An expanded treatment of this issue is contained in Alaska OCS Technical Paper No. 1.

b. Summary of Probable Impacts: The probable impacts are based on the assumption that gas could be discovered and that oil is not going to be discovered in the deleted blocks; consequently, according to USGS, the resource estimate for this alternative is the same as the proposal. In this case, the expected number of spills and expected potential impacts from oilspills are the same as the proposal. If commercial quantities of oil are located in the southern blocks, there would be significant potential impacts to the Yukon Delta. Using this assumption, this alternative significantly reduces potential impacts to the Yukon Delta region.

Alternative VI would delete 157 blocks in the southern part of the proposed lease sale area. According to USGS resource estimates, no oil is expected to

Figure II.B.6.a.–1



Source: Alaska OCS Office (1981)

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be found in these deleted blocks. In keeping with this assumption, the expected number of oilspills and the potential impacts from oilspills would be the same as for the proposal. If commercial quantities of oil are located in the southern deletion blocks, it would pose significant potential impacts to the Yukon Delta. Therefore, this alternative significantly reduces the potential for oil-related impacts to the Yukon Delta region.

Cumulative effects which would result from this alternative and other major projects (Sec. IV.A.8.) would be similar to the cumulative impacts from the proposal because the oil resource estimates are the same (Sec. II.B.1.e.).

C. Comparative Analysis of Alternatives and Impacts

This discussion deals with the most significant differences and similarities among impacts and alternatives in comparison with the proposed action (Alternative I). See Section II.B.1.e. for a summary of impacts that could result from the proposed action.

Alternative II (no sale) would eliminate those impacts described in the proposal. The cancellation of proposed sale 57 could pose potentially adverse impacts on the national economy by continuing increased dependence on imported oil and gas. Impacts could occur as a result of development of alternative energy sources. Refer to the FEIS for the proposed 5-year oil and gas lease sale schedule, Appendix H for proposed lease sale 70, and the FEIS for OCS sale 55, Eastern Gulf of Alaska (DOI, 1980), for a general discussion of the potential impacts that could result from various alternative energy sources. Alternative II would also eliminate any adverse impacts attributable to the proposal.

Alternative III (delay the sale) would delay potential impacts of the proposal, but would not avoid them. Biological and social impacts could be reduced by some unquantifiable degree if the delay were used to strategically plan for community impacts on the Nome area and to fill biological data gaps, especially with regard to birds and marine mammals. These studies could help to better understand potential impacts on the biological resources of Norton Sound and could provide additional information to more effectively mitigate potential impacts.

Alternative IV would delete 121 blocks from the proposed sale area in the northern portion of Norton Sound. This alternative would not significantly reduce major potential impacts on the human and biological resources of the Sound. Some reductions in potential risk from oilspills could be expected for the northern coast of Norton Sound, although these areas are only of low potential impact with the proposed leasing plan. The major reduction in potential risk due to an oilspill would be to the eastern coast of St. Lawrence Island, which would be reduced from a high to moderate level of potential impact. The deletion of the northern blocks would lower the sociocultural impacts moderately but would not affect the location of an enclave at Cape Nome and the associated impacts. Peak employment impact would be about half as great as for the proposal. Commercial fisheries resources and potential subsistence fishing impacts would be moderately reduced as a result of this action. There would be a noticeable reduction in risks to some seabirds and their foraging habitats; however, most of the risks come from the potential tanker facility pipelines to Cape Nome which are similar to the proposal. The

overall potential impacts to marine mammals and endangered species would probably not be significantly different from those associated with the proposal.

Alternative V would delete 181 blocks in the eastern half of the proposed sale area. This alternative would significantly reduce major potential impacts on the human and biological resources of the Norton Sound area. Given the significantly reduced resource estimates, offshore loading of oil and gas are assumed for this alternative. Peak employment impact would be only 29 percent as great as for the proposal. Since all OCS support would be totally or substantially enclave, offshore major impacts on local population would be significantly reduced. Some potential reductions in risk from oilspills could be expected within Norton Sound. These reductions would be expected primarily for the northern coast of Norton Sound, as well as for portions of the Yukon Delta and Stuart Island; however, these areas are of a low potential risk even with the proposed action. The eastern coast of St. Lawrence Island would be significantly reduced in potential risk for an oilspill. The risk factor would be reduced from a high to a low potential. Significant reduction in potential risk to birds and their habitats along the Seward Peninsula and Yukon River Delta would be expected with this alternative. Similar reductions in the potential impacts could be expected for marine mammals and endangered species. Overall disturbance and potential impacts could be significantly reduced, especially in the inner Norton Sound area, due to the reduced level of activities associated with this alternative.

Alternative VI would delete 157 blocks in the southern part of the proposed lease sale area. According to USGS resource estimates, no oil is expected to be found in these deleted blocks. In keeping with this assumption, the expected number of oilspills and the potential impacts from oilspills would be the same as for the proposal.

III.

DESCRIPTION OF THE AFFECTED ENVIRONMENT

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A. Physical Considerations

1. Environmental Geology and Ice Hazards: The following description is based on a grouping of potential hazards in terms of the degree of concern expressed during the scoping process for sale 57 and in the Norton Sound Synthesis Meeting held in Anchorage, Alaska, on October 28-30, 1980. (The synthesis meeting is a forum in which principal investigators from the Outer Continental Shelf Environmental Assessment Program (OCSEAP) meet with members of the Alaska OCS Office, as well as others, to discuss the BLM-funded ongoing OCSEAP research and the available data pertaining to an offshore area such as Norton Sound.)

The hazards shown in Table III.A.1.-1 were considered from three perspectives: the degree of potential hazard without mitigation by engineering design, the capability for engineering to design for the potential hazards, and the extent to which additional data would be necessary to facilitate such engineering designs. The concept of mitigating potential natural hazards by engineering design is in compliance with the Best Available and Safest Technology (BAST) principle required by USGS Operating Orders for OCS oil and gas activities. BAST is an acronym for best available and safest technology. The ranking listed below is in terms of the cumulative degree of concern without respect to mitigation by engineering design. The degree of mitigation by engineering design and appropriate data gaps will be discussed in Constraints on Oil and Gas Activities in Section IV.A.7.

Ranking by degree of concern:

Major Concern

a. Ice forces

b. Faults

c. Thermogenic gas

d. Earthquakes and seismicity

e. Storm surges

Moderate Concern

f. Current scouring

g. Wind and waves

h. Biogenic gas

i. Liquefaction of sediments

Negligible Concern

j. Sheet Flow (Seabed sediment transport)

Table III.A.1.-1

FACILITY / HAZARD IN ORDER OF CONCERN	JACK–UP RIGS SUMMER	GRAVITY PLATFORM	PILE SUPPORT PLATFORM	FLOATING DRILLING VESSEL	GRAVEL ISLAND	PIPE LINE	TANKER	ONSHORE PRODUCTION FACILITY	OFFSHORE TERMINAL	LOGISTIC	DRILLING
ICE FORCES	Ø N Ø	1 M 1	Ø M Ø	Ø M 1	Ø L–M Ø	Ø N Ø	Ø M–H 1	1 L Ø	1 M 2	Ø M Ø	Ø N Ø
FAULTS	1 H Ø	1 H Ø	1 H Ø	Ø N Ø	1 H Ø	1 H 1	Ø N Ø	1 H Ø	1 H Ø	Ø N Ø	Ø H Ø
THERMOGENIC GAS	Ø H Ø	Ø H Ø	Ø H Ø	Ø N Ø	Ø H Ø	Ø H Ø	Ø N Ø	Ø N Ø	Ø H Ø	Ø N Ø	Ø H 1
SEISMICITY (EARTHQUAKES)	1 M Ø	1 M Ø	1 M Ø	Ø N Ø	1 M Ø	1 M Ø	Ø N Ø	1 M Ø	1 M Ø	Ø N Ø	Ø N Ø
STORM SURGE	1 M Ø	1 M Ø	1 M Ø	1 M Ø	1 M Ø	Ø N Ø	1 M Ø	1 M Ø	1 M Ø	1 N Ø	Ø N Ø
CURRENT SCOUR	Ø M Ø	Ø H Ø	Ø M Ø	Ø N Ø	Ø M Ø	Ø H 1	Ø N Ø	Ø N Ø	Ø M Ø	Ø N Ø	Ø N Ø
WIND/WAVE	1 L Ø	1 M Ø	1 M Ø	1 M Ø	1 M Ø	Ø N Ø	Ø L Ø	Ø L Ø	1 M Ø	1 M Ø	Ø N Ø
BIOGENIC GAS	1 M Ø	1 H 1	1 L Ø	Ø N Ø	1 M 1	1 M 1	Ø N Ø	Ø N Ø	1 H 1	Ø N Ø	Ø N Ø
LIQUEFACTION	1 M Ø	1 M 1	1 L Ø	Ø N Ø	1 L Ø	1 H 1	Ø N Ø	Ø N Ø	1 M 1	Ø N Ø	Ø N Ø
SHEET FLOW	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø H Ø	Ø N Ø	Ø M Ø	Ø N Ø	Ø N Ø	Ø N Ø
ICE GOUGING	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø H Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø
COASTAL EROSION	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø L Ø	Ø N Ø	Ø H Ø	Ø N Ø	Ø N Ø	Ø N Ø
PERMAFROST	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	1 L Ø	Ø N Ø	1 M Ø	Ø N Ø	Ø N Ø	Ø N Ø
SAND WAVES	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø L Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø
SEDIMENT SENSITIVITY	1 NK	1 NK	1 NK	1 NK	1 NK	1 NK	Ø N	1 NK	1 NK	Ø N	Ø N
SUPERSTRUCTURE ICING	Ø N Ø	Ø N Ø	Ø N Ø	Ø L Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø N Ø	Ø M Ø	Ø N Ø

ENVIRONMENTAL HAZARDS IN NORTON SOUND PROPOSED OCS SALE 57

SEVERITY OF HAZARD

N– Not a hazard
L – Low
M – Moderate
H – High
NK – Not known

TECHNOLOGY (lower right)

Ø – Exists now
1 – Will be available within 5 years
2 – Will be available in 5 to 10 years

NEED FOR ADDITIONAL DATA (upper left)

Ø – No further field data needed
1 – Additional field data needed but not critical prior to lease sale
2 – Additional field data needed and critical to lease sale

k. Ice gouging

l. Coastal erosion

m. Permafrost

n. Sand waves

The following describes only those natural hazards which were identified in the Norton Sound Synthesis Meeting as having a potentially moderate or high hazard before mitigation by engineering design and/or compliance with existing federal regulations. The sequence of the items discussed also corresponds to an overall ranking previously noted.

a. Ice Forces: The following briefly describes of the various ice formations within Norton Sound. These zones, according to Stringer (1980), as shown in Figures III.A.1.-1 and III.A.1.-2, are: (1) stable fast ice areas, (2) flaw lead areas, (3) nearshore pack ice area, (4) flaw lead and ice pressure area, (5) persistent polynyas, (6) ice growth and compaction areas, (7) Norton Sound pack ice, (8) dynamic ice areas, and (9) potential grounded ridge area. Additionally, the Bering Sea pack ice, which usually moves southward from the Bering Strait but occasionally moves in the reverse from south to north, forms a major area of ice forces to the west of the mouth of Norton Sound.

Stable Fast Ice: The stable fast ice as shown in Figure III.A.1.-1 forms a broad band along the southern perimeter of Norton Sound but a relatively narrow band along the northern coast. Stable fast ice is annual ice which is generally anchored to a shoreline and to the sea bed in water depths less than 2 meters. Tidal fluctuations and occasional storm surges can cause cracks, ice pileups near the edge of the fast ice, and ice push on the shoreline. Ice pileups, override, and ice push are most likely to occur during the formation of the shorefast ice from November through January and again during spring breakup in April and May. Villagers who inhabit the region from Kotlik to Nelson Island report that during low tide in the fall, the thin ice that forms on the mudflats will, on the incoming tide, move either offshore or further onshore and into the river channels in response to the wind conditions. iven the appropriate wind speeds, this ice, in the form of sheets, can move very rapidly and cause overrides or pileups.

Flaw Lead Areas: Flaw lead areas occur when the edge of the fast ice significantly varies in its location. These are in effect narrow leads or cracks with open water between the fast ice edge and moving pack ice. Such leads, which can frequently open and close, indicate a transition area in terms of the stability of the ice. Based on the experiences of many inhabitants of the AVCP geographic region, dramatic changes can occur in the flaw lead area. The size of the leads can change very rapidly. Overrides, pileups, and ridges can form in a short time and then be carried away by currents.

Nearshore Pack Ice Area: Nearshore pack ice occurs in areas that are close to the fast ice edge where the water is between 10 to 25 meters deep. Nearshore

Figure III.A.1–1

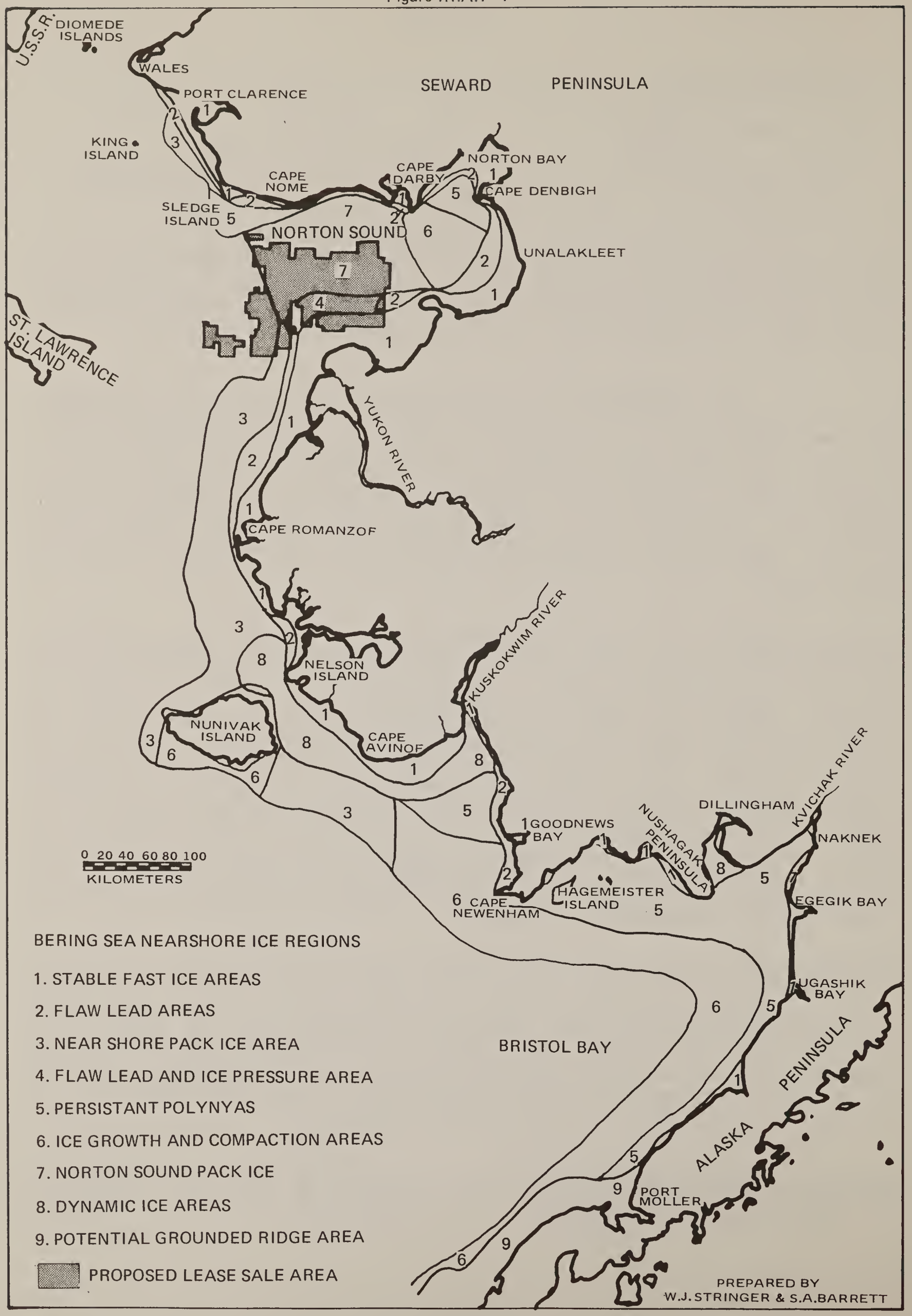
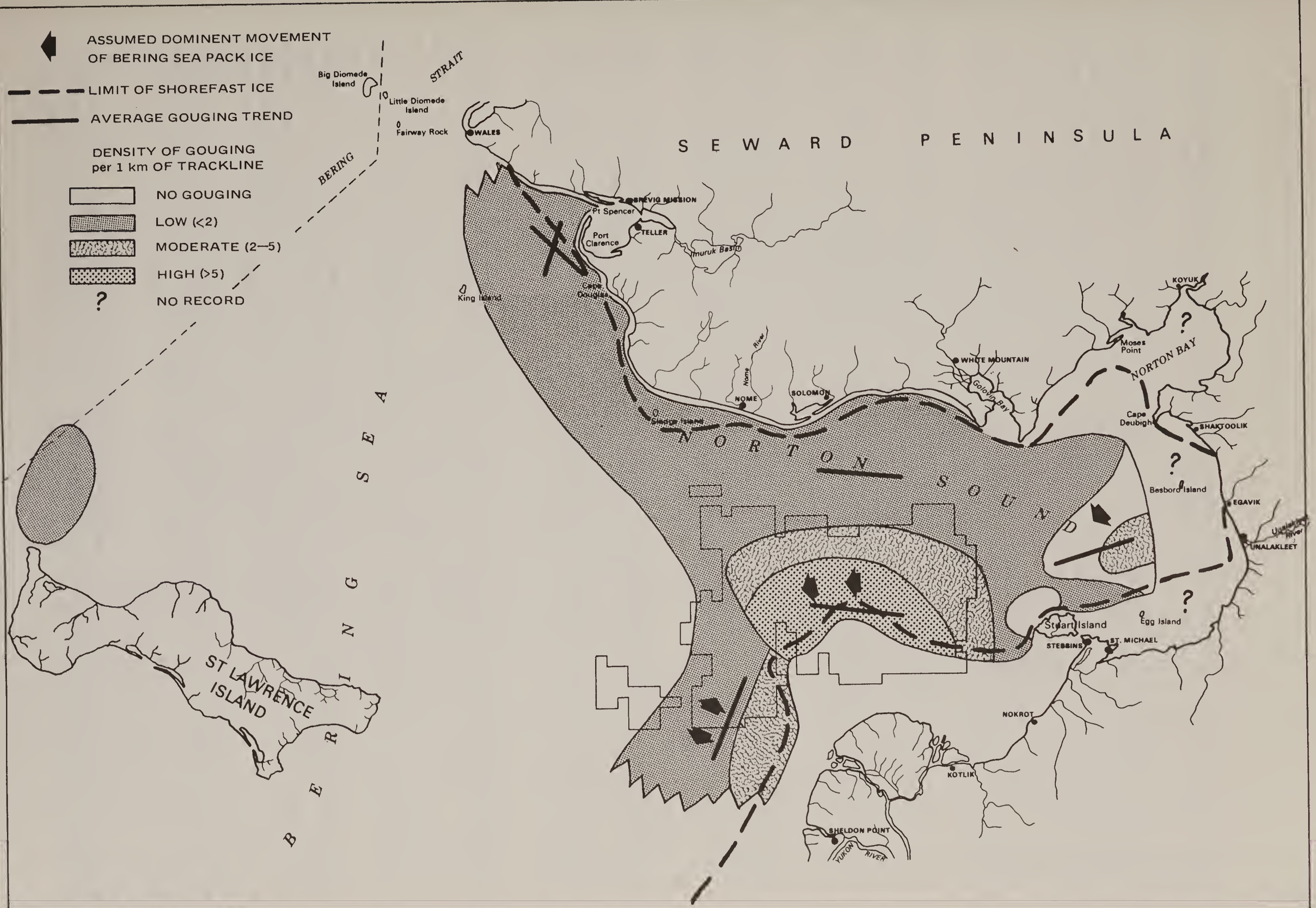


Figure III. A. 1.–2



Source: Thor And Nelson, 1979

ICE GOUGING PATTERNS AND MOVEMENT

pack ice can sporadically close a flaw lead and attach itself temporarily to the fast ice edge. Since this nearshore pack ice is moving and often closes flaw leads, it comes in physical contact with the edge of the fast ice and pressure ridges can form. Based on recent evidence by Stringer (1980), the average speed of moving pack ice within Norton Sound is approximately 0.076 knots; and the maximum speed measured thus far from satellite studies is 0.27 knots. In contrast, Bering Sea ice moving southward from the Bering Strait past the Norton Sound Bight averages 0.3 knots with maximum speeds of about 1.0 knot. AVCP-region village elders noted that during the period from 1977 to 1980 of OCSEAP-sponsored investigations, the winter winds were principally from the south. This type of wind pattern is unusual over a 4-year period and last occurred during the time of World War I.

Flaw Lead and Pressure Area: The flaw lead and ice pressure area is another transition zone of dynamic interaction between the nearshore pack ice and the edge of the fast ice. Pack ice interacts with grounded or bottom-fast ice near the entrance to Norton Sound and on the northern side of Nunivak Island. The key ice features found to occur in this zone are grounded pressure ridges, rubble piles, and flaw leads working the edge of the fast ice.

Persistent Polynyas: As shown in Figure III.A.1.-1, there are many zones of persistent polynyas in areas of newly forming ice. Newly forming ice is normally quite thin. Typical wind patterns in these areas tend to move the newly formed ice seaward towards the Bering Sea. As a result, areas of open water are formed offshore from the shorefast ice.

Ice Growth and Compaction Areas: Zone 6 in Figure III.A.1.-1 indicates areas of newly formed ice closest to areas of persistent polynyas. The ice in this zone moves seaward towards the Bering Sea and tends to raft and pile up. Outside of Norton Sound Zone 6, ice generally occurs in areas with water depths greater than or equal to 20 meters; and it is compacting and growing in thickness.

Norton Sound Pack Ice: This zone of ice occurs primarily in the central region of Norton Sound and is usually between 0.7 and 1.2 meters thick (Thor and Nelson, 1981). Water depths in this zone are predominantly greater than 15 meters; the remainder are greater than 20 meters. The surface of the ice in this zone is constantly being broken into pans of ice which keep moving at average speeds of 0.076 knots. Large leads also often occur in this zone.

Bering Sea Oceanic Ice: McNutt (1980) indicates that Bering Sea ice is quite mobile. It flows predominantly from the Bering Strait towards the southern Bering Sea and can be completely replaced from three to ten times in any given ice season. The sea ice itself consists of a mixture of multiyear floes with annual ice. As a collective canopy of ice, it rarely covers the northern Bering as a solid sheet of ice. Stringer (1980) has indicated a maximum speed of about 1 knot for this Bering Sea ice. The Bering Sea pack ice generally moves from north to south past the Norton Sound Bight at speeds up to four times that of ice floes within Norton Sound. Under certain conditions, Bering Sea ice can enter Norton Sound.

Stringer (1980) has shown that Bering Sea ice moves into Norton Sound when its heading is between 20° and 160°. When Bering Sea ice has a heading of 160° to 170°, gyres can be formed at or in the entrance to Norton Sound. When the

heading of Bering Sea ice is from 170° to 20°, ice within Norton Sound tends to move out into the Bering Sea.

Again, on the basis of recent work by Stringer and Hufford (1980), it appears that a decreasing positive atmospheric pressure gradient between Nome and Barrow, Alaska, is the cause for either the movement of Bering Sea ice into Norton Sound or the formation of gyres at the entrance to Norton Sound. However, ice within Norton Sound can move outward under most other gradient conditions. In summary, short term oceanic currents tend to move Bering Sea ice into Norton Sound when there is a lessening or reduction of positive atmospheric pressure gradients between Nome and Barrow. Stringer and Hufford (1980) further suggest that the movement of water and ice into Norton Sound occurs in a return to "normal" sea level conditions before periods of south to north atmospheric pressure gradients in the Norton Sound region.

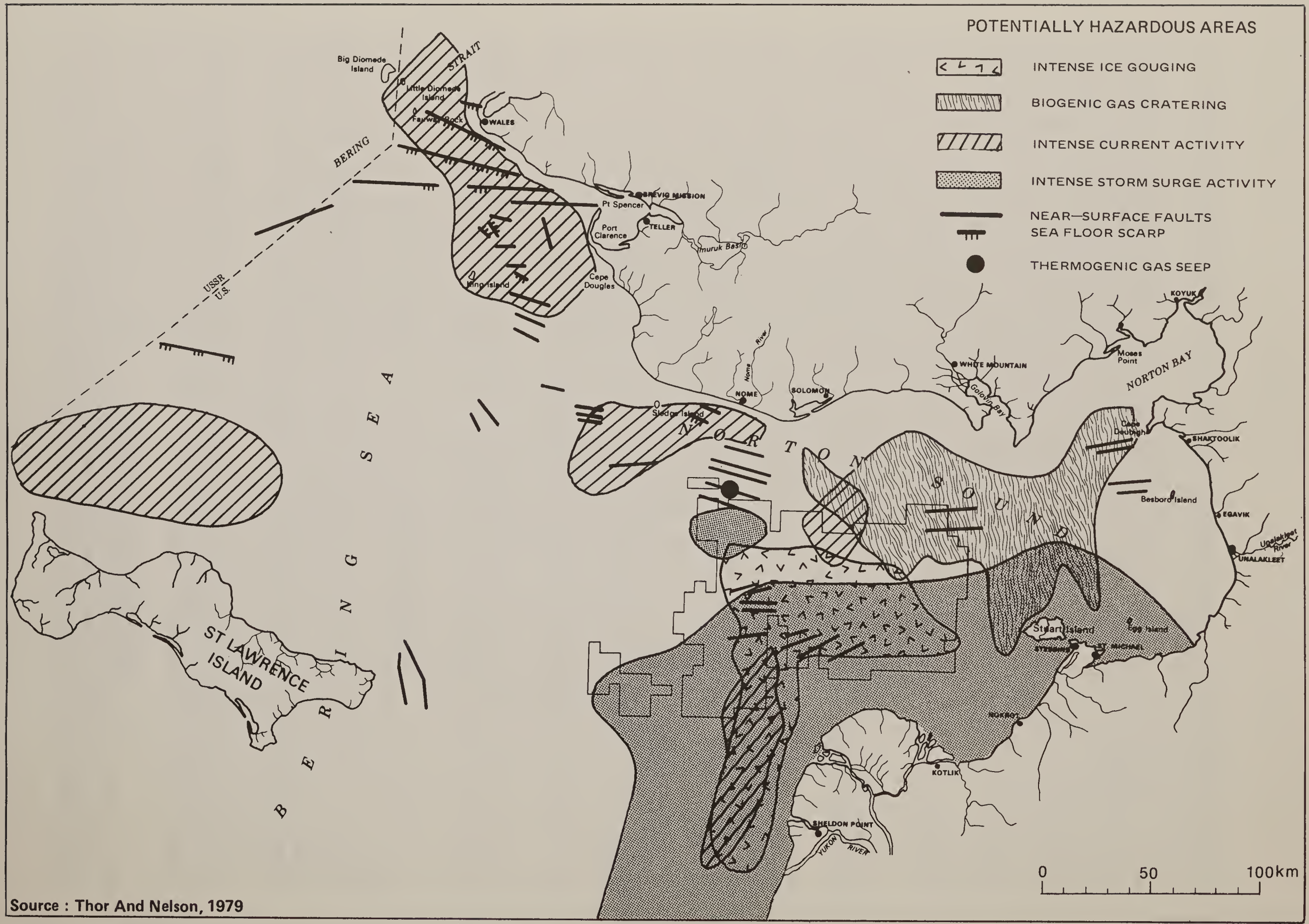
b. Faults: Seismic studies indicate the presence of many deep-seated and near-surface faults in Norton Sound; Figure III.A.1.-3 shows the distribution of known near-surface faults. Although the seismic records may show relative displacement along a fault, the timing of the movement must be ascertained from other sources. The activity associated with these faults may have ceased, or it may be taking place very slowly. This consideration is based on the observation that most of the faults lack surface expression in the form of scarps and that very few earthquakes in Norton Sound have been recorded during historic times. On the other hand, erosional-depositional processes may have obscured any surface scarps, or a slow, steady rate of movement along the fault may have prevented the buildup of strain and a subsequent earthquake producing rupture. (Johnson and Holemes, 1980.) The slow rate of displacement is indicated in many of the seismic records. These records show an increase in displacement with depth and an apparent thickening of the beds on the downthrown sides of the faults. Consequently, movement may have taken place more or less continuously during subsidence of the large sedimentary basin which underlies Norton Sound (Johnson and Holmes, 1980). However, the rate of the basin subsidence may have decreased since the end of the Pleistocene Epoch. At this time, the land separating the Bering and Chukchi Seas was flooded because of a rise in sea level; and some of the sediments entering the Norton Basin were transported through the Bering Strait into the Chukchi Sea.

c. Thermogenic Gas: As shown in Figure III.A.1.-4, thermogenic gas has been found at a single location in Norton Sound, due south of Nome. This thermogenic gas is an accumulation of primarily CO_2 gas in a zone that is 9 kilometers in diameter and 100 meters below the sediment surface. It should be clearly understood that CO_2 gas is not a pollutant to the water column, the atmosphere, or the wildlife. The potential hazard involved with this gas deposit is primarily to certain types of oil and gas operations and to the equipment which may be used for these operations.

According to Nelson (1980), the gas appears to migrate to the surface of the sea bed along shallow surface faults. It then escapes from the seabed or accumulates in near-surface sediments.

d. Earthquakes and Seismicity: Biswas (1980) has shown that the maximum magnitude of earthquakes occurring in Norton Sound over the past 2 years is 4.2. There have been two earthquakes with magnitudes of 6.0 and 6.5 on the Seward Peninsula to the north of Norton Sound within the last 30 years.

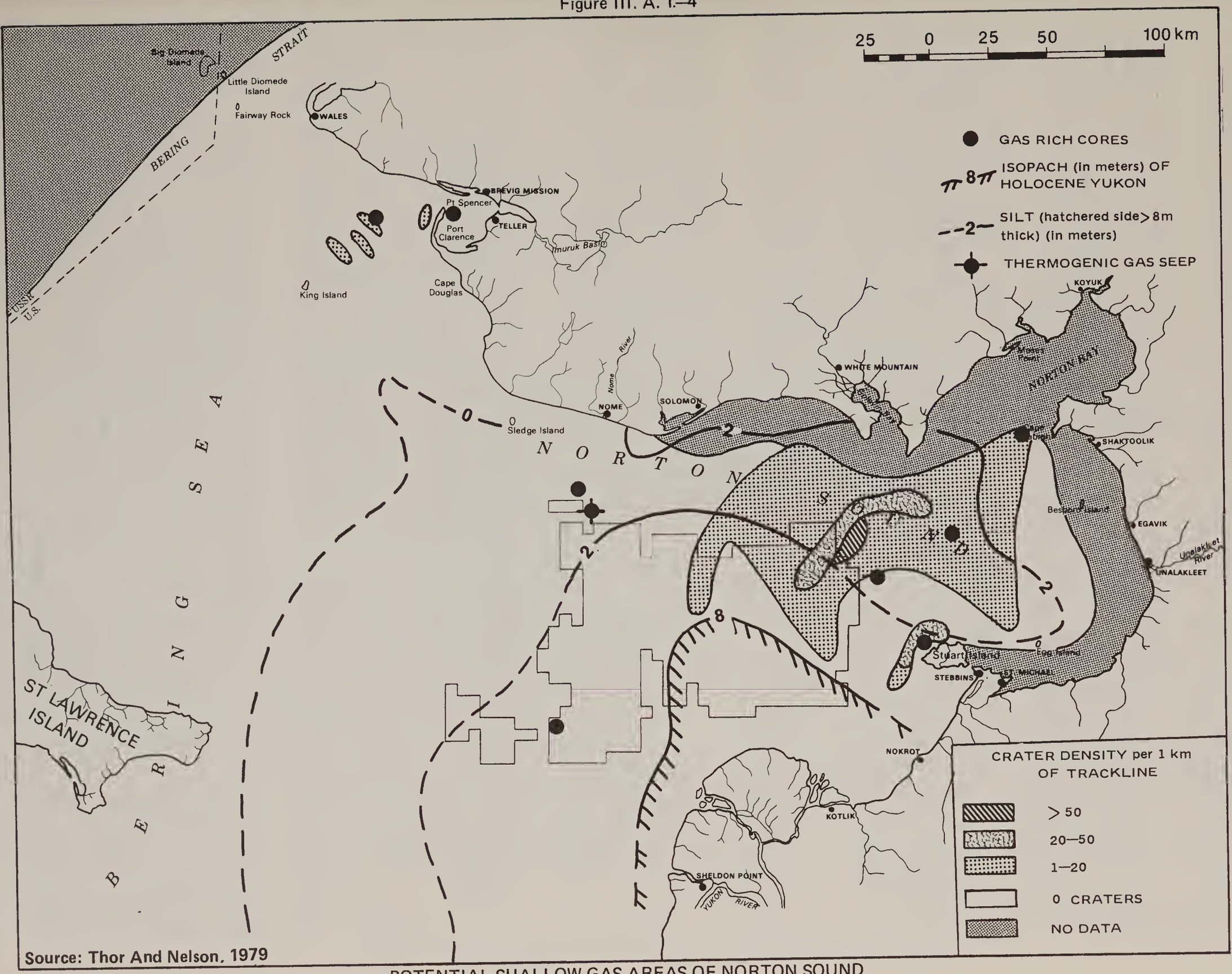
Figure III. A. 1.–3



Source : Thor And Nelson, 1979

POTENTIAL NATURAL HAZARDS OF NORTON SOUND

Figure III. A. 1.–4



Source: Thor And Nelson, 1979

POTENTIAL SHALLOW GAS AREAS OF NORTON SOUND

Mapped earthquake epicenters show clustering along or parallel to mapped faults and linear structural trends (Biswas, et. al., 1980).

e. Storm Surges: Storm surges are increases in water levels due to severe storms. In Norton Sound, water levels can rise up to 5 meters and flood considerable portions of the low-lying coastal areas. Storm surges can also carry large blocks of ice onto the beach environment as well as disrupt the shorefast ice. For a more detailed description, see the section on meteorological conditions and physical oceanography (Sec. III.A.2.).

f. Current Scouring: Nelson (1980) has shown (Fig. III.A.1.-5) that current scours depressions can be as deep as 2 meters in depth. Current scouring is related to the movement of water near the seabed as a result of storm activity. Non-storm-related currents in Norton Sound are generally less than 1 knot at the surface and much less at the seabed. Nelson (1980) has shown that a single storm surge can scour up to a half meter of sediment. Scour generally occurs around and from beneath objects.

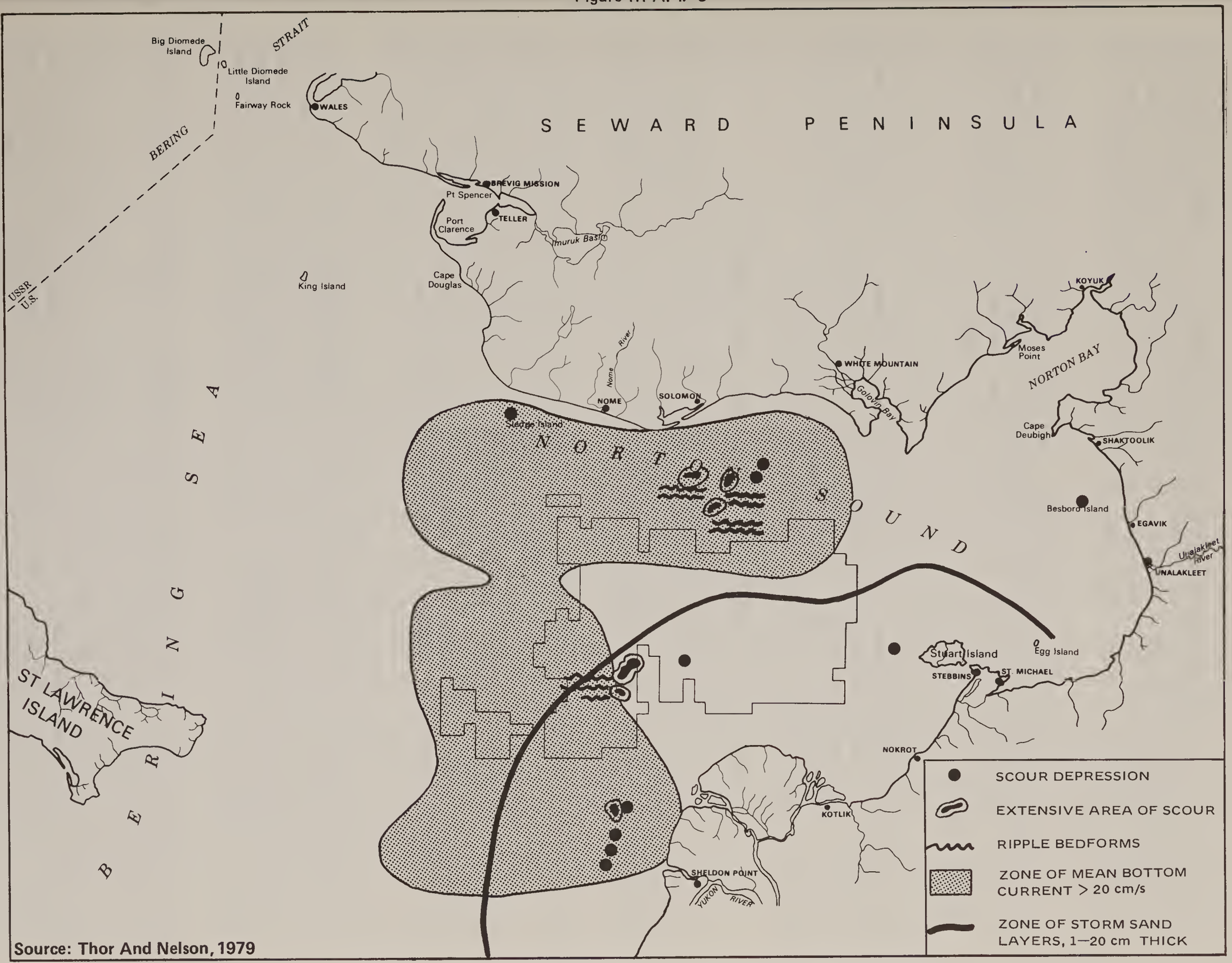
g. Wind and Waves: Available data indicates that wind and waves present a moderate hazard to onshore and offshore facilities. A more detailed description of these elements can be found in the section on meteorological conditions and physical oceanography (Sec. III.A.2.).

h. Biogenic Gas: Peats and organic-rich sediments covered by relatively thin layers of recent sediments (1- to 2-meter) underly portions of Norton Sound. The decomposition of the organic material results in high concentrations of methane gas at rather shallow depths below the sea floor. It has been suggested that these gas-charged sediments may be the cause of small, circular craters found over a 20,000 square kilometer area of the sea floor in central and eastern Norton Sound (Fig. III.A.1.-4).

i. Liquefaction of Sediments: Liquefaction of loose, fine sand-to coarse, silt-size marine sediment is caused by a buildup of pore-water pressure as the deposits are subjected to cyclic loading of high-intensity storm waves (Clukey, et al., 1980). As the sediment responds to these loads, the particles tend to compact. However, if the permeability of the deposits is too low, instantaneous reorientation of the particles will not occur and pore-water pressure builds. As the pressure increases with successive loads, the shear resistence between particles decreases, and the deposit may eventually act as a viscous fluid and flow downslope. However, as pore-water pressure dissipates over time, the particles tend to move closer together and the deposits become more stable.

The susceptibility of the sediments appears to be related to a number a variables which include the type of sediment, permeability of the deposit, water depth, and exposure to relatively large storm-generated waves (Clukey, et al., 1980). Thus, sediments in the shallow waters of the western prodelta of the Yukon River and the central part of Norton Sound are the most susceptible to liquefaction (Larsen, et al., 1981). The sediments become less susceptible to liquefaction as the size of the sediment particles, the deposit permeability, or the water depth increases. Also, sediments deposited in environments that are not exposed to large waves are less susceptible to liquefaction than sediments in the more exposed areas.

Figure III A. 1.–5



Source: Thor And Nelson, 1979

POTENTIAL SEDIMENT TRANSPORT HAZARDS OF NORTON SOUND

j. Sheet Flow (Seabed Sediment Transport): Nelson (1980) has shown that storm-generated, mass movement of surface sheets of seabed sediment is a possibility. If impeded by solid objects, a sheet could become a wedge of sediment anywhere from 1 to 5 centimeters thick. It was considered by the synthesis meeting to be a relatively high degree of hazard to pipelines and offshore facilities.

It has been found that the following potential hazards do not represent significant, unmitigatable hazards or constraints to OCS activities; therefore they will not be described further. Those items include ice gouging, coastal erosion, permafrost, sand waves, superstructure icing, and geotechnical soil sensitivity.

Descriptive discussions of the technical and scientific aspects for each hazard have been limited herein. The bibliography, however, contains extensive references to scientific publications which were used to arrive at the foregoing technical assessments. These references should also provide the general, non-technical reader with adequate material about the scientific aspects of the physical processes dominant in Norton Sound.

2. Meteorological Conditions and Physical Oceanography:

a. Climate and Setting: The blocks which comprise proposed OCS lease sale 57 are almost entirely within Norton Sound. Norton Sound is a shallow, high-latitude embayment which extends eastward from the northern Bering Sea and forms an indentation in the central west coast of Alaska. Its east-west length is about 220 kilometers; its width is about 150 kilometers.

Climatically, Norton Sound belongs to a subarctic, semi-arid weather regime. It is located in a geographical region of extreme seasonal variability. During the June-September summer, the Sound is free of ice, and air temperatures are well above freezing. The waters are exposed to a 24-hour daylight (though not necessarily direct sunlight during part of this period) and generally light, variable winds. By November, air temperatures have dropped below freezing and ice formation normally begins along the northern shore. First ice usually forms on the surface in Norton Bay at the northeast corner of the Sound. Ice growth continues southward until, by mid-December, the entire Sound is more or less covered. This ice cover, which usually persists until April or May, consists primarily of loose pack ice, 0.7 to 1.2 meters thick (Thor and Nelson, 1981), except for shorefast ice in nearshore regions and some distance offshore in the region of the Yukon River Delta. Direct observations of the ice are limited; most of the information on its distribution and extent has been obtained through use of satellite data (Muench and Ahlnas, 1976; Ahlnas and Wendler, 1979).

During winter, the ice cover markedly reduces air-sea exchange of heat, moisture, and momentum. This would ameliorate effects on the water of low air temperatures and winter storms.

The dominating physical phenomenon in the Bering Sea is the seasonal change in the position of the Aleutian low, which executes an annual clockwise rotation. In early autumn, the Aleutian low migrates out of the northern Bering Sea and crosses the Alaska Peninsula. In winter, the low is usually located in the Gulf of Alaska (approximately 55° N., 155° W.). The winds at Kodiak, which are

caused by the low in this position, are from the northeast. They tend to intensify the flow of the Alaska Stream and cause coastal sea levels to be higher than the annual mean. In late winter, the mean center of the Aleutian low moves to the southwest and in early spring it moves northward into the northern Bering Sea. In March, this low allows storms to migrate or be guided over the ulf of Alaska and the Bering Sea (Hood and Calder, 1980).

Annual precipitation over the proposed sale area averages between 35.5 and 41.6 centimeters (14 to 17 in); and half of all moisture is recorded in the months of July, August, and September. Temperatures within the proposed sale area vary between January means of -15° to -17°C (5° to -1.4°F) and July means of 10° to 13°C (50° to 55°F). Observed wind directions over the area are seasonally variable and range from an average summer flow of 7 to 10 knots from the south and southwest to a winter flow which averages 10 to 15 knots from the east and northeast. Table III.A.2.a.-1 gives the mean annual maximum and minimum temperatures, average annual precipitation and prevailing surface wind directions, and average annual wind speeds for selected sites near Norton Sound. Tables III.A.2.a.-2 and III.A.2.a.-3 show the annual maximum winds and waves and maximum sustained winds for selected return periods, respectively, for Norton Sound. Norton Sound is exposed to large waves from the south and southwest, but these waves are severely attenuated owing to the shallow water (Hanley, et al., 1980). Waves begin to break when the water-depth to wave-height ratio is less than 1. Depending on the characteristics of the waves and the seafloor, this ratio may vary from 0.60 to 0.78 (Inman, 1963). Thus storm-generated waves in the proposed sale area that are higher than the maximum water depth will begin to break when the water depth under the propagating waves shoals to a lesser depth than the maximum. A storm surge will increase the depth maximum by the height of the surge in the affected area. Table III.A.2.a.-4 indicates the annual percentage of precipitation types in the vicinity of and around Norton Sound. Optimum visibility periods vary within the area according to the time of year. However, the fall months of September and October usually offer the viewer the most benign atmospheric conditions while the mid-winter (blowing snow) and mid-summer (prolonged fog) months engender the greatest visual impairment (Brower, et al., 1977). Table III.A.2.a.-4 gives the percent frequency of annual fog, smoke, and haze, as well as blowing snow in Norton Sound and vicinity. The percentage of fog also includes ice fog.

b. Sea Ice Distribution: During winter and spring, ice covers nearly the entire northeast half of the Bering Sea. The southern portion of the covered area contains thin, first-year ice 30 to 71 centimeters (12-28 in) thick near the end of its growth cycle, whereas the northern portion and immediate coastal areas north of 62° north latitude attain medium first-year growth of from 71 to 122 centimeters (28-48 in). The Bering Strait is covered throughout the growth cycle with predominantly thin and medium first-year ice.

Normally, the Bering Sea is essentially free of sea ice by early summer. Ice concentrations in areas north of the Bering Strait continue to decrease as the summer progresses. Beginning in October, the pack edge reverses direction and begins to move south. It reaches its maximum southward position during late March, probably more because of wind drift than freezing. The greatest rate of movement for both retreat and advance occurs between the northern Bering and the southern Chukchi Seas during freezeup and breakup periods. More rapid

Table III.A.2.a.-1

Annual Temperature Variations, Precipitation,
and Prevailing Surface Winds for
Selected Sites Near and About Norton Sound

Reporting Station	Mean Annual Maximum Temp. (^{o}C)	Mean Annual Minimum Temp. (^{o}C)	Average Annual Precipitation (inches-Rain & Snow)	Average Annual Snowfall (inches)	Prevailing Surface Wind Direction & Average Annual Speed (knots)
1. Gambell, St. Lawrence Island	-2.2	-6.6	15.82	79.7	NE 15.5
2. Northeast Cape, St. Lawrence Island	-1.1	-6.2	16.06	68.6	N 11.2
3. Nome	0.3	-7.4	16.44	53.7	N 9.6
4. Moses Point	-0.2	-7.8	18.93	81.7	NNE 12.4
5. Unalakleet	0.8	-7.0	14.16	40.5	ENE 10.5
6. Cape Romanzof	0.7	-4.2	25.38	71.1	NE 11.7

Note: If the mean annual temperature variation is less than zero, some onshore permafrost can be expected to be present.

Source: Brower, et al., 1977.

Table III.A.2.a.-2

Annual Maximum Winds and Waves[1] for the
Norton Sound Vicinity and Selected Return Periods

Return Period (years)	Maximum Sustained Winds (knots)	(m.p.h.)	Maximum Significant Waves (meters-feet)	Extreme Waves (meters-feet)
5	78	89	13.5m - 45ft	24.5m - 81ft
10	84	97	15.5m - 51ft	28.0m - 92ft
25	94	108	18.5m - 60ft	33.0m - 108ft
50	102	117	20.5m - 67ft	36.0m - 121ft
100	110	127	23.0m - 76ft	42.5m - 136ft

Source: Brower, et al., 1977.

1. See III.A.2.a. for a discussion of maximum expected wave heights.

Table III.A.2.a.-3

Annual Maximum Sustained Winds for
Selected Return Periods for
Reporting Meteorological Stations in Norton Sound

	Return Period - Years						
	2	5	10	25	50	100	200
Station: Nome, AK (Period of Record: 1954 - 75)							
Upper Bound (mph)	47.84	56.26	63.30	74.78	86.23	101.65	123.72
Wind Estimate (mph)	46.04	53.02	58.20	65.49	71.48	77.97	85.02
Lower Bound (mph)	44.31	49.96	53.52	57.36	59.26	59.80	58.42
Station: Moses Point, AK (Period of Record: 1944 - 64)							
Upper Bound (mph)	50.43	61.19	70.44	86.00	102.04	124.36	157.57
Wind Estimate (mph)	48.13	56.92	63.60	73.18	81.21	90.05	99.81
Lower Bound (mph)	45.94	52.95	57.43	62.27	64.63	65.20	63.22
Station: Unalakleet, AK (Period of Record: 1949 - 75)							
Upper Bound (mph)	47.52	59.01	68.99	85.89	103.40	127.87	164.40
Wind Estimate (mph)	45.35	54.88	62.27	73.05	82.23	92.48	103.97
Lower Bound (mph)	43.28	51.04	56.20	62.12	65.39	66.89	65.76

Source: Brower, et al., 1977.

Table III.A.2.a.-4

Percent Frequency of Occurrence of
Precipitation Type and of Obstructions to Vision

Reporting Station	Annual Rain or Drizzle[1]	Annual Freezing Rain or Freezing Drizzle[1]	Annual Snow or Sleet[1]	Annual Fog[2]	Annual Smoke or Haze[2]	Annual Blowing Snow[2]
Northeast Cape, St. Lawrence Island.	9.9	0.2	13.9	22.2	0.05	7.0
Nome	10.5	1.0	14.9	11.0	0.1	2.6
Moses Point	8.5	0.3	12.2	No Data Available	No Data Available	No Data Available
Unalakleet	7.7	0.4	10.2	4.9	0.9	2.3
Cape Romanzof	11.3	0.2	11.0	22.0	0.1	9.5

1. Percent frequency of occurrence of precipitation by type is based upon hourly observations regardless of intensity.

2. Percent frequency of occurrence of obstruction to vision is based upon hourly observations.

Source: Brower, et al., 1977.

recession of the ice edge during May and June results from disintegration closely related to the location and extent of large water openings within the main body of the pack ice. Two such openings occur in Kotzebue and Norton Sounds (Brower, et al., 1977). The mean positions and range of pack-ice edge in the Bering Sea for the four seasons are shown in Figure III.A.2.b.-1.

Ice will begin forming in Norton Sound sometime after mid-October and the Sound will be covered by December. Ice thickness in the open Norton Sound is 0.7 to 1.2 meters (1.6 to 3.9 ft); however, ice thickness can reach 2 meters (6.6 ft) Thor and Nelson, (1981). Shorefast ice extends seaward to about the 10-meter isobath (33 ft) and is best developed in the southern part of the Sound off the Yukon Delta. This shorefast ice zone varies in width from 10 to 30 kilometers (6.2 to 18.6 mi). Ice cover over the proposed sale area reaches its maximum during the period of January through March. Average ice cover of 50 percent or less is not reached until approximately mid-May, while the area is not ice free until mid-June or later (Brower, et al., 1977).

In the Bering Sea the thickness of ice increases from east to west. "Breakout" and transport depends upon the ocean currents, ice strength, and prevailing winds. Transport by winds is due to large scale meteorological events over the Arctic and Bering Seas.

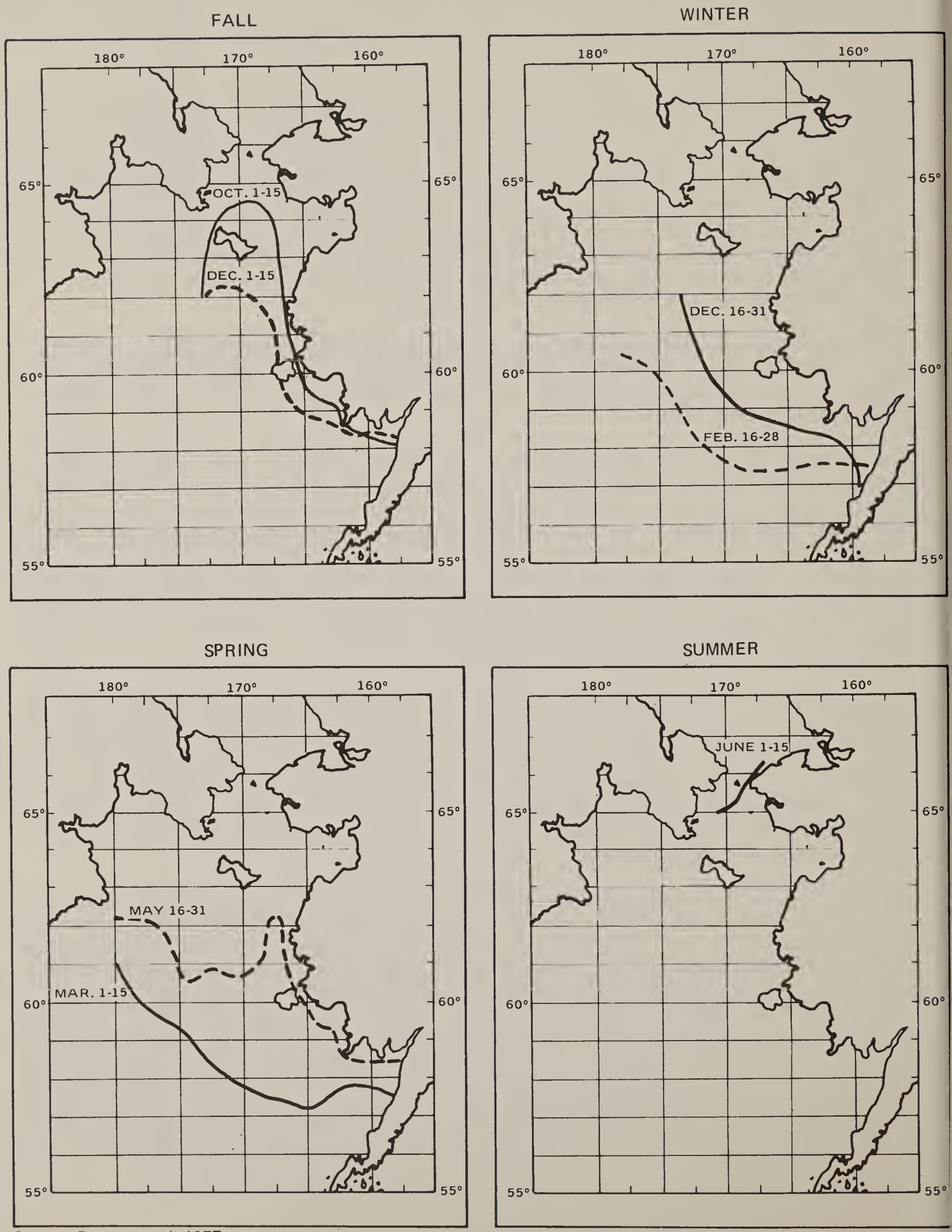
The Norton Sound is characterized by polynya, which are semipermanent to permanent in waters near Cape Nome and are a permanent feature in eastern Norton Sound. Polynya, which are winter open-water areas where sea ice forms, are regions of severe structural icing to ships. Since polynya are new regions of ice formation, these areas are generally difficult to work in and present definite hydrometeorological hazards during late fall and winter months. In addition, in Norton Sound there is a high frequency of ice gouging around the Yukon Delta region by sea ice with ridges as high as 15 meters (50 ft.) and in water depths around 20 meters.

c. Bathymetry: Depths of the proposed lease sale area vary from less than 10 meters in the southern portion to more than 30 meters in a trough-like feature which extends east-west in the nearshore region south of Nome. The eastern boundary of the proposed sale area ranges from about 12 to 18 meters. In the proposed area, the marine bottom is relatively featureless and slopes gradually westward to depths of about 30 meters. The bathymetry of the area will change somewhat with major shifts in substrate in response to storm surges and ice gouging.

d. Circulation: A more nearly correct interpretation would be to say something like: "The flow over the western one-third of the lease area is to the north and provides a significant portion of the 0.8 (Sverdrup) northerly mean transport through Bering Strait (Coachman and Aagaard [1981]). In Norton Sound proper, or over the eastern portion of the lease area, the circulation is weakly cyclonic (Graphic No. 3). During the open water season, the freshening of the water near shore by runoff and high insolation rates overall cause a high degree of water-column stratification. This stratification is a significant feature which dictates the circulation in Norton Sound. As a result, the upper-layer circulation is largely uncoupled from that of the lower layer. Cyclonic circulation takes place in both upper and lower layers, with speeds on the order of 1.0 cm/sec or less in the lower layer and somewhat

Figure III.A.2.b.-1

MEAN POSITIONS AND RANGES OF PACK ICE EDGE IN THE BERING SEA



Source: Brower, et al, 1977

greater in the upper layer. The currents across the mouth of the Sound, over the western part of the lease area, are on the order of 10 cm/sec toward the north, with noticeable coherence between top and bottom layers. While net flow is to the north, reversals can occur depending on atmospheric pressure difference between Arctic and Bering."

Drift bottles released within Norton Sound tend to support the general circulation pattern within the Sound. Most drift bottle recoveries were made on the eastern and northern shores within Norton Sound. Bottles released between St. Lawrence Island and the Yukon River Delta were recovered primarily on the northern shore of the Sound (Burbank, 1979).

As the Alaska coastal current flows past Norton Sound, it tends to mix with the Yukon River water in the vicinity of the Delta. These mixed waters extend across the mouth of the Sound toward the Nome coast. Part of the discharge from the Yukon River may move into the Sound as part of the cyclonic gyre (Cacchione and Drake, 1979). Bottom sediments in the inner part of Norton Sound are derived from the Yukon River (Nelson and Craeger, 1977). Sediments carried into the inner part of Norton Sound tend to remain there due to the low energy of bottom currents in this region. During stormy periods, bottom currents increase significantly, causing extreme resuspension of bottom sediments and transport that prevents large net accumulation of sediments within Norton Sound (Cacchione and Drake, 1979).

In the summer, the eastern and western parts of the Sound are separated into two distinct flow regimes and are roughly coincident with the constriction formed by Cape Darby on the north and Stuart Island on the south. The eastern portion is distinctly layered where warm freshwater is sufficient to overcome mixing by tidal dissipation. Weak cyclonic flow in the eastern upper layer does not occur in the lower layer, where cold and highly saline bottom waters remain nearly in place. The net effect is very sluggish circulation in the eastern Sound. This forms a stagnant bottom water layer, with flushing possibly occurring only during storm events. In the western Sound, both upper- and lower-layer net flow is northward. During winter, winds become stronger and predominately from the northeast, averting surface water out of the Sound. Under the circumstances, bottom water circulation is likely to be complex and is not understood.

During winter, the period of ice cover (October-April) can be expected to reduce nearshore transport rates by as much as 60 to 80 percent (see Leendertse and Liu, 1981). However, during the winter months in Norton Sound the dominant direction of ice movement is southwestward, out of the Sound, under the influence of northeasterly winds. The ice produced in Norton Sound is steadily moved by winter winds to the southwest toward the ice front south of St. Lawrence Island. Eastward movement averages about 3.5 kilometers per day with considerable variations in speed. One-day southwest exit speeds as great as 15 kilometers per day have been observed (Stringer, 1978). Spring breakup of ice begins in Norton Sound about April and is usually completed by mid-June. Ice generally moves southwest with northerly winds. After mid-spring, however, when the winds become more sporadic, nearly all ice movement is to the northwest. During breakup, broken ice and pans in Norton Sound move to the front (west of Sledge Island) and eventually to the Bering Strait.

If an oilspill should occur under the ice during the winter period, the oil would accumulate at the ice-seawater interface. The oil would probably move with the ice flow (up to a velocity difference of about 20 centimeters per second) between ice and underlying surface water. Because of momentum transfer between ice and water, this threshold difference would only rarely be exceeded. In all cases, the soluble components of the oilspill are transported with the prevailing water circulation patterns as described.

e. Tides: Tidal currents within Norton Sound are predominantly diurnal, except near the entrance where semi-diurnal components are also important. The magnitude of the tidal excursion ranges from negligible near the vicinity of the shorefast ice to approximately 13 kilometers in the middle of Norton Sound. The exception is intermediate excursions in the vicinity of the Yukon Delta and Nome (Pearson et al., 1981). Tidal-height records indicate ranges of 1.6 to 6.8 feet within the Norton Sound area (Table III.A.2.e.-1).

f. Storm Surges: The northern Bering Sea has a history of severe storm surges, and the entire Norton Sound area is vulnerable to storm surges (Jones, et al., 1980). Surges are normally the result of wind stress movement of surface waters above normal tidal range (average range about 2 meters). The surges are sometimes reinforced by a rise in sea level, caused by a reduction in barometric pressure as the low center passes. This effect is fairly common in the northernmost part of the Bering Sea. It usually occurs during late summer or early fall and results in a sea level rise of 1 to 3 meters above mean high water. During late summer and early fall, strong winds from the southwest drive water into the shallow embayments.

The most recent and well-known major storm event occurred in the Nome area during November 10 to 17, 1974. The storm was estimated to be a once-in-30-years event. Total rise of waters was estimated at 7.6 meters (25 ft) where normal tide range was 1.2 meters (4 ft). Some parts of Nome were under 3.1 meters (10 ft) of water. Maximum sustained winds of 38 knots and gusts to 70 knots were recorded at the height of the storm. Also during this storm, water levels greater than 5 meters above mean high water were seen at the eastern end of Norton Sound; and there was about 3.5 meters of rise over the northern part of the Yukon Delta (Sallenger et al., 1978).

A major storm event also occurred on October 2 to 4, 1960, near Unalakleet, and had a combined sea and swell of 6.2 meters (20 ft), sustained winds of 50 knots, and maximum gusts of 60 knots (Brower, 1977).

B. Social Systems

The following discussion focuses first on the historical and current population of the area. It then turns attention to the sociocultural systems, followed by the predominant subsistence lifestyles of area residents. Next, it looks at village livelihood as a broader context of village life which includes cash and wage support for subsistence activities. The final section discusses the infrastructure of Nome itself, the likely site of any onshore facilities. For a discussion of historic Nome, see Section III.D.2.b.

1. Population: During the thousands of years of existence of the Bering Land Bridge, hunting and gathering peoples from Asia migrated into

Table III.A.2.e.-1

TIDAL DATA ABOUT AND NEAR NORTON SOUND

Station No.	Reporting Tidal Station	Diurnal Range (ft)	Maximum Diurnal Tide (ft)	Minimum Diurnal Tide (ft)	Maximum Tide (ft)	Minimum Tide (ft)
19	Northeast Cape, St. Lawrence Island	2.4	3.0	1.1	2.8	-0.3
20	Moghoweyik River, St. Lawrence Island	1.7	2.7	0.2	2.1	-0.6
21	Cape Romanof	6.8	10.8	0.9	8.6	-2.2
22	Kwikluak Pass	2.3	2.4	0.6	2.1	-0.3
23	Apoon Mouth	4.0	6.5	0.2	5.3	-0.6
24	St. Michael	3.9	5.8	0.1	5.2	-0.6
25	Carolyn Island	1.8	2.7	0.0	2.4	-0.3
26	Nome	1.6	2.4	0.0	2.0	-0.5

Source: Brower, 1977.

Alaska. They moved north and south, inland across the Alaskan and Canadian arctic as far as Greenland, and south into what is now the continental United States and Central and South America. Based on archaeological and linguistic records, the present-day Yupik and Inupiat Eskimo of the Norton Sound, Bering Strait, and Yukon Delta regions are descendents of those early migrants across the Bering Land Bridge, no doubt among the last migrants.

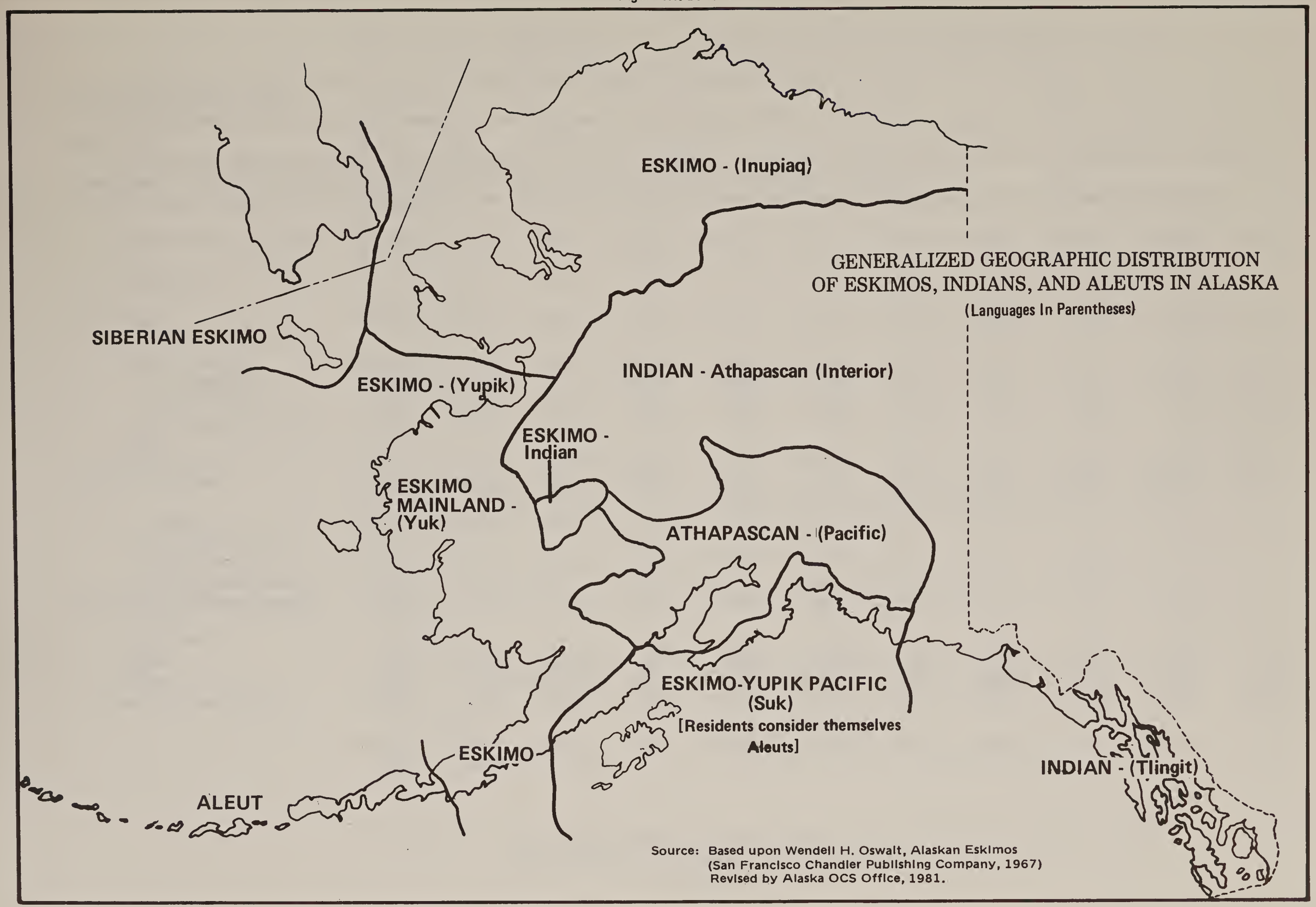
Figure III.B.1.-1 shows the distribution of contemporary language groups in Alaska and the extent of movement and settlement which has occurred over centuries of human habitation. Table III.B.1.-1 provides an overview of estimated Alaska Native population by language-culture group from earliest recorded history to 1970. The western Eskimo group is estimated to have numbered 31,400 in 1970. Of this number, 8,060 were Inupiat, 785 were Siberian Yupik, and 18,655 were Bering Sea Yupik Eskimo (Kresge, Morehouse, and Rogers, 1977). This total represents a return to and slight increase over the estimated traditional levels of western Eskimo population estimated for the 1740 to 1780 period.

Comparative population data from the 19th century indicates that the traditional villages with the largest populations were located in areas of greatest resource potential, consistent with the subsistence way of life of the Eskimo people of the area. For example, St. Lawrence Island, Little and Big Diomede Islands, and the village of Wales were (and are) strategically located near whale, walrus, and other sea mammal migration routes in the Bering Strait (Ellanna 1980). On the Seward Peninsula, smaller villages within a 20- to 30-mile radius of larger villages were interrelated to these larger, more-permanent villages by family ties, trade, and barter relationships--as well as other political and social ties--into a cluster of related villages. All maintained the same complementary subsistence patterns of resource dependence. These clusterings of villages helped to protect families and villages from fluctuations in subsistence resources, severe weather conditions, and other crises. The larger villages, particularly in winter, were sites of trade and ceremonial activities. Among whaling villages, the size and political strength of a village could be measured by the number of community or ceremonial houses (Kasgis). These community houses became the center for the maintenance of the social and political alliances which held the culture group together over time, providing for the trade of goods and food unavailable locally. Smaller villages and camps for fishing, hunting, and berry picking were (and are) maintained seasonally or, at a smaller scale, on a permanent basis. Territories were occupied and maintained over time in conjunction with these territorial alliances, in spite of declines in specific subsistence resources (Ray, 1964). Other Norton Sound and Yukon Delta villages without the Umealik organizational of structure normally had one community house (Kasgi).

Four communities within the Bering Strait region originated as centers of trade during the 19th century and have attracted residents from the region's smaller villages in more recent times: Saint Michael and Unalakleet, former posts of the Russian-America Company; Nome, a old-Rush town; and Port Clarence (Teller), a former center of reindeer herding and European whaling activity.

Table III.B.1.-2 provides historic and current population statistics by community. There are 25 communities in the area, most of which are small, subsistence-based villages oriented around the exploitation of local resources.

Figure III. B. 1.- 1



Source: Based upon Wendell H. Oswalt, Alaskan Eskimos (San Francisco Chandler Publishing Company, 1967) Revised by Alaska OCS Office, 1981.

Table III.B.1.-1
Estimated Distribution of Alaska Native Population By
Cultural and Linguistic Classifications, 1740-1970

	Circa 1740-80	Circa 1839-44	1880	1890	1910	1920	1929	1939	1950	1960	1970
I. Northwest Coast Indian	11,800	8,300	8,510	5,463	5,685	5,261	5,895	6,179	7,300	7,900	8,300
Tlingit	10,000	6,565	7,712	4,115	4,426	3,895	4,462	4,643	5,500	6,000	6,300
Haida	1,800	1,735	798	395	530	524	588	655	750	800	800
Tshimshian	—	—	—	953	729	842	845	881	1,050	1,100	1,200
II. Northern Athapascan Indian[a]	6,900	4,000	4,057	3,520	3,916	4,657	4,935	4,671	5,100	6,500	8,300
Interior (Ingalik, Koyukon, Tanana, Kutchin)	4,800	2,100	3,193	2,531	2,922	3,657	3,935	3,671	3,900	5,000	6,400
Pacific (Eyak, Athena, Tanaina)	2,100	1,900	864	989	994	1,000	1,000	1,000	1,200	1,500	1,900
III. Western Eskimo	26,600	24,500	17,617	13,871	15,279	14,990	17,171	19,169	19,320	24,800	31,400
Inupiat (Arctic)	6,350	6,000	3,492	2,336	3,305	3,487	4,227	5,489	5,600	6,200	8,060
Yupik											
Siberian (St. Lawrence)	600	600	500	267	292	300	389	505	540	636	785
Yuk (Nunivak)	400	400	408	373	301	184	181	215	203	232	258
Yuk (Bering Sea)	10,550	10,000	9,702	8,734	8,502	8,313	10,184	10,414	10,617	15,232	18,397
Suk (Pacific)[b]	8,700	7,500	2,242	2,161	2,879	2,706	2,190	2,546	2,360	2,500	3,900
IV. Aleut[c]	12,000	2,200	2,628	1,679	1,451	1,650	1,857	2,006	2,180	2,800	3,100
V. Unclassified	—	—	184	821	—	—	125	433	—	—	—
	—	—	—	—	—	—	—	—	—	—	—
TOTAL ALASKA NATIVE	57,300	39,00	32,996	25,354	25,331	26,558	29,983	32,458	33,900	42,000	51,100

Sources: Table reproduced from Kresge Morehouse, and Rogers 1977, Table 2.1. Classification based on Oswalt. 1880-1910 from Indian Population of the United States and Alaska, 1910 (U.S. Bureau of the Census 1915), pp. 111-115. "Indian" includes Eskimo and Aleut.

[a] Division by Interior and Pacific Athapascan estimated for 1920, 1929, and 1939. Note: See also Alaska Native Language Center expansions of this group, Kraus, 1974.

[b] Identified as "Aleut" in recent census and other reports. Belong to Koniag (Kodiak Island) and Chugach (Prince William Sound). Classified by Oswalt as Pacific (Suk) dialect of Yupik.

[c] 1920-1950 classified by location. 1960-1970 includes estimates of urban and relocated Aleuts.

Table III.B.1.-2
Historic Population Statistics for Communities
Within the Nome Census Division and Selected Communities
Within Wade Hampton Census Division on the Yukon Delta, 1950-1980

Community or Area	1950	1960	1970	1975	1980
Total Nome Census Division	NA	6,091	5,749	6,660	NA
City of Nome and nearby areas	1,876	2,316	2,488	2,595	2,892
Brevig Mission	109	77	123	144	147
Council	NA	NA	NA	30	NA
Diomede	NA	88	84	141	125
Elim	154	145	174	196	218
Gambell	309	358	372	367	447
Golovin	NA	59	117	116	118
Koyuk	NA	129	122	160	178
Mary's Igloo	64	5	NA	2	*
Savoonga	249	346	364	410	409
Shaktoolik	127	187	151	162	160
Shishmaref	NA	217	267	306	373
Solomon	NA	NA	NA	6	*
Stebbins	NA	158	231	298	309
St. Michael	157	205	207	220	282
Teller	160	217	220	221	258
Unalakleet	469	574	434	601	632
Wales	141	128	131	117	130
White Mountain	129	151	87	111	115
Total Wade Hampton Census Division	2,443	3,128	3,917	NA	NA
Yukon Delta:					
Alakanuk	NA	278	265	512	527
Kotlik	NA	57	228	284	305
Mountain Village	NA	---	419	513	543
St. Mary's	NA	---	384	415	436
Sheldon Point	NA	125	125	136	143
Emmonak	NA	NA	439	545	545

Sources: Statistics for individual communities were taken from "Overall Economic Development Program for the Bering Strait Region." Census Division statistics for 1950, 1960, and 1970 are those published by the U.S. Bureau of the Census. Census Division statistics for 1975 are estimates prepared by the Alaska Department of Labor, Research and Analysis Section. The 1980 community totals are Alaska revenue sharing population, published by the Alaska Department of Community and Regional Affairs. See also Ellanna and Roche, 1976.

Table III.B.1.-3
Ethnic Distribution of Study Area Populations

Bering Strait	Percent Total Eskimo	Percent Total Caucasian	Percent Other
City of Nome	60.6	37.5	1.9
Brevig Mission	98	2	---
Council	83	17	---
Diomede	99	.5	.5
Elim	97	3	---
Gambell	96	3.5	.5
Golovin	98	2	---
Koyuk	96	4	---
Mary's Igloo	50	50	---
Savoonga	96	4	---
Shaktoolik	96	4	---
Shishmaref	97	3	---
Solomon	100	0	---
Stebbins	97	2	1
St. Michael	95	5	---
Teller	93	7	---
Unalakleet	87.5	12	.5
Wales	94	6	---
White Mountain	96	4	---
Yukon Delta			
Alakanuk	97	3	---
Kotlik	97	3	---
Mountain Village	97	3	---
St. Mary's	87.5	12	.5
Sheldon Point	96	4	---
Emmonak	96	4	---

Source: Ellanna, 1980, Table II, p. 16.

Historically, the largest community in the area was Nome with a population of 12,488 in 1900. (The Gold Rush began at Anvil Creek in 1898.) In 1980, Nome's population was 2,892, still the largest in the region.

Unalakleet, a subregional center in the inner Norton Sound, had a population of 632 in 1980. Several villages on the Yukon Delta and on St. Lawrence Island had populations of between 400-600 in 1980, reflecting the abundance of the salmon and sea mammal resources on which these villages depend. The census divisions of Nome and Wade Hampton encompass the villages in the proposed lease sale area.

Table III.B.1.-3 shows ethnic distribution in the Norton Sound-Yukon Delta area. Nome and all of the area villages are now predominately exclusively Eskimo. Villages from Unalakleet north are part of the Inupiat Eskimo group; those from Unalakleet south are part of the Yupik Eskimo group. These language and culture groupings correspond closely, but not exactly, to the subsistence use patterns discussed in Section III.B.3.

Nome and Wade Hampton census divisions both have a relatively young age distribution, characterized by relatively large families. Ellanna and Roche (1976) report an average household size of 4.56 in the Bering Strait region. Nome household size is small and village household sizes are larger than this average. The 1970 median age for the Nome census division was 19.1, while for the Wade Hampton division it was 16.8 (U.S. Census Division, 1970).

For a more complete discussion of historic and recent population trends in the proposed area, see Ellanna, 1980; Ellanna and Roche, 1976; Ray, 1975; Ray, 1964; Policy Analysts, Ltd., 1980; and Environmental Services Ltd., 1980.

Table IV.B.3.b.-3 presents base case population projections for the Nome area, assuming no OCS exploration and development and an economy dominated by government and government contractual services in health, social services, and construction. These projections include the Alaska Gold Company, Nome-Beltz, FAA, and Icy View areas outside the Nome city limits. They are assumed to apply to the October-April period, or permanent year-round population, rather than a somewhat higher summer seasonal population.

2. Sociocultural Systems:

a. Social Systems: The interrelationship of the many social subsystems in the Norton Sound area implies changes within when any one of them is altered.

The sociological and cultural resources of the Norton Sound region are derived from the past and the present population elements previously described in Section III.B.1. These sociocultural elements are important aspects in determining the future of the people in the Norton Sound area. Some of this culture will be retained, changed, or discarded. Since there are many definitions of social resources and just as many of cultural resources, the following paragraphs summarize Technical Report (TR) 54 of the OCS sociocultural contract--as well as other authors for the Norton Sound region--whenever possible. Cultural resources such as historical and archaeological sites are discussed in Section III.E.1.

Eskimo cultures of the Kingikmiut, Kauwarak, Unaligmiut, and Ikogmiut will be most affected by the sale 57 area proposal and its alternatives. In some ways, these cultures are very different from Native cultures elsewhere in the United States. In others, they are very similar. (See TR 54 for details.) Their social heritage and tradition, rules and behavior, ideals and values, adjustment and problem solving, learning, habits, psychology, patterns and organization of culture, products, art, ideas, and symbols are unique to Eskimo culture and valuable to the country. Yet they use modern tools and methods as well. Thus, their culture is an interrelated complexity of Eskimo past and modern technological present.

The Native Norton Sound people are family-oriented in most of their lifestyle. The family role is the dominant factor in the individual's behavior and the family pattern is extended rather than nuclear. The meaning of family ties differs from social relationships in modern western culture. For example, the "stranger" in the village is usually defined by his lack of family ties. (Refer to Ellanna, 1980, TR 54, Vol. II, pp. 367-368, for details about the family in Norton Sound villages.) However, modern ideals, the influence of missionaries and modern church doctrine have to some extent changed and complicated old ideas about family life. The satellite television programs also affect the younger as well as the older members of the villages. The younger Natives have modern ideas of family structures obtained from television mixed with the traditional ideas. This is especially true of Nome, Unalakleet, and Elim on Norton Sound and Mountain Village, Pilot Station, and Alakanuk on the Yukon River Delta. Because of the high dependence on subsistence lifestyle, many of the family-member functions are related to hunting and fishing activities. In the larger villages, such as Unalakleet and Nome, they are less frequently so related. One may find such discussion of family functions related to subsistence by referring to Wolfe (1979), Food Production in a Western Eskimo Population, and Yukon Delta Sociocultural Systems Study (1981).

The village communities of the Norton Sound area and the Yukon Delta are organized in a system similar to the "umealiq," or skinboat, captain-type organization. Thus, the social system is very close to the familial system, except that interaction with the modern "outside" societal agencies has produced many complexities (TR 54, Vol. II, pp. 369-374). Individual roles such as a store owner, water and waste system operator, electrical powerplant operator, nurse's aide, and school teacher are intertwined with the roles of hunter, fisherman, craftsman, etc., to build a much more complex community. Complexity serves to "muddy" the clarity of indicators used in the impact section. Nome is one of the most complex of the communities in the area. The smaller communities like Stebbins and Kotlik are the least complex. (Refer to TR 54 for details on the community organization of Norton Sound.)

Such human services as education, health, and housing are performed more frequently by the regional, state, or church systems rather than the family, as was the case in recent historical and prehistoric times. New high schools with modern classrooms (i.e., lighting, chairs, visual aids, and the latest and best equipment), which are supported by regional, state, and federal funds, are appearing in villages such as Golovin and Alakanuk. Consequently, more students are receiving education in the villages rather than at more distant locations. Hospitals which "reach" into the villages are being erected in larger communities (Nome and Bethel). These hospitals have the latest

equipment and are almost fully staffed. Modern housing is being supplied through agencies such as Housing and Urban Development (HUD), and these houses have the latest in equipment and conveniences. Additionally, water and waste systems for housing are provided in nearly every village in the Norton Sound area. However, it is difficult to train and keep the operators for maintaining these systems when outside opportunities arise which draw them away. Maintenance of the facilities is also difficult when increases in populations overload them and when cold weather conditions cause them to breakdown (Ryan and Tornfelt, 1977). Often, then, the problem is largely to retain personnel who can keep up with the changes in the physical support facilities. Such problems indicate the influence of regional, state, and national systems on the community needs. (Refer to TR 59, p. 389, for details on delivery systems in the Norton Sound area.)

b. Political Systems: Nome can probably be best described as a regional center with multiple economic and, hence, political factors in which the villages and Nome-based Natives play both a direct and indirect role through their membership in the Bering Straits Native Corporation (BSNC); Kawerak, Inc.; and Sitnasuak; and through the Alaska Native Claims Settlement Act (ANCSA) land rights. (Refer to TR 54, pp. 392-418, for details.)

Yukon River Delta village governments are a part of the Norton Sound political systems. These villages would be indirectly impacted by oil exploration because of many physical and social changes (e.g., change in population, subsistence, and cash economy) that exploration would bring about. The following is a brief description of village governments. More specific data on government funding, facilities, council members, etc., may be obtained from the Alaska Department of Community and Regional Affairs (DCRA, 1979).

Mountain Village, Chevak, Fortuna Ledge, Sheldon Point, Hooper Bay, Kotlik, Alakanuk, Emmonak, and Scammon Bay are all second class cities. As such, they are governed by a 7-member city council which chooses a mayor to administer the city on a political level. Under state law, these villages assume diverse powers such as the ability to tax the village people and others within their jurisdiction. This power is one source of political energy which can be impacted positively or negatively by oil-derived income and influence and could change social relations. Income is also derived from revenue sharing Rural Development Assistance (RDA) grants.

Revenue funds are usually distributed on a per capita basis, and population increases or decreases due to OCS activities could impact this source of political energy. Cities can also charge for public services performed by their employees. In the Yukon Delta cities that have been mentioned, these employees include administrators, treasurers, policemen, janitors, pumphouse operators, recreation specialists, heavy equipment operators, airstrip maintenance people, powerplant operators, village communications operators, youth program coordinators, and a host of others. Any changes in city revenues would affect the performance of the socioeconomic functions mentioned in the opening paragraphs of this section as essential to the survival of both social and political systems. These impacts would likely be positive, but they may sometimes be negative. Political transformations at the village level also change relations on the regional and state levels and vice versa.

Another important aspect of the village government is shown in the political energies of non-city programs and services. Each of the communities of Chevak, Mountain Village, Fortuna Ledge, Sheldon Point, Hooper Bay, Kotlik, Alakanuk, Emmonak, and Scammon Bay is represented by a 5-member traditional council. Adoption of a constitution and by-laws gives these villages recognition by the Bureau of Indian Affairs (BIA) and, accordingly, authority to administer funds from a variety of federal programs such as health services, employment assistance, college assistance, social services, tribal operations, and many others. These services in some villages are also provided through regional tribal organizations such as the Yukon-Kuskokwim Health Corporations (YKHC) and the Association of Village Council Presidents, Inc. (AVCP). Some villages receive funds from RDA and the Economic Development Administration (EDA). The traditional council's control on the distribution of these funds is a source of political energy in the system which can be impacted by OCS-related population and income distribution.

c. Interethnic Relations and Implied Attitudes: Sources and diversity of interethnic contact and conflict are many. The Norton Sound people resolved them in an interesting but complex way (refer to Interethnic Relations and Implied Attitudes, TR 54, pp. 418-427). As a result of ANCSA and the establishment of Native corporations, Native political power and status have increased. Representatives from Native agencies meet with other agencies at home; in Juneau; and Washington, D.C.; to lobby and negotiate with increasing success for the people to whom they are responsible.

d. Indicators of Response to Change: Awareness of certain indicators of change is important in evaluating impacts in Section IV.B.1.b. of this document. The more important of these are mental health, alcohol abuse, and crime rates, as well as positive indicators such as cultural revitalization, new identity, and new business interests. enerally, the studies indicate that both negative and positive indicators are increasing. The increase of negative indicators shows a corresponding increase in problems, and the positive indicators show attempts to eliminate and ameliorate the problems. (For details, see TR 54, pp. 427-439.)

Depending on the degree of interaction between oil exploration and development enclaves and the amount of deviance, alcoholism, number of communicable diseases, poverty, illegitimate pregnancies, and many others, indicators of disorganization will become more or less prominent. (Refer to Appendix B, Enclave Assumptions.) Literature on boom towns in the United States, particularly that by William R. Freudenburg (1978), may be consulted for details on the high-interaction side of the continuum. The indicators of social impacts to scrutinize in these studies, which are those related to village well-being, include incidences of drunkenness, delinquency, and divorce. High frequencies of these symptoms show stress on village inhabitants. These frequencies are tempered by a knowledge of the size of the community and the types of new people coming into the village or community; and they are usually due to the changes that are taking place in the behavior, values, and perceptions of the communities' long-time residents. It is difficult but possible to assess the change in frequencies due to oil and gas by comparing the projections for non-OCS with the projections that have OCS populations.

When a higher proportion of new people come into a village, or Nome, there is a change in the performance of the economic function (subsistence in the village), performance of the political function, control of deviance, performance of socialization (training) of the young, caring for the needy, and maintaining personal morale. The indicators of response to oil exploration and change mentioned in the preceding are among those that show how the village performs the four vital functions of goal achievement, adaptation to a changing social and physical environment, integration of its members into a whole, and maintenance of its sociocultural form. High positive indicators on each of these functions is evidence of a healthy and energetic community. Low positive indicators on each function is evidence of an unhealthy, unenergetic community.

The perception of people in the Norton Sound villages on how oil exploration and development is going to affect them is as important a social variable as is the real environmental and social affect. Details on how people perceive this impact can be found in the scoping memorandum for this area which is discussed in Sections I.F. and V.B. and Appendix H.

3. Subsistence Patterns: The people of the Bering Strait, Norton Sound, and Yukon Delta participate in a way of life often referred to as "subsistence." This way of life is a continuation of traditional patterns continuous for several centuries. While few elements have been added, the old practices, traditions, and values persist and integrate the new elements into age-old patterns.

Definitions: Alaska statutes define "subsistence uses" as those customary and traditional uses in Alaska of wild, renewable resources for direct personal or family consumption (AS Sec. 16.05.940).

The Alaska National Interest Lands Act (PL 96-487, December 2, 1980), Sections 803 and 804, states:

> "Section 803 As used in this act, the term 'subsistence uses' means the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade. For the purposes of this section, the term:
>
> 1. 'family' means all persons related by blood, marriage, or adoption, or any person living within the household on a permanent basis; and
>
> 2. 'barter' means the exchange of fish or wildlife or their parts, taken for subsistence uses:
>
> A. for other fish or game or their parts; or
>
> B. for other food or for nonedible items other than money if the exchange is of limited and noncommercial nature.
>
> Section 804. Except as otherwise provided in this act and other Federal laws, the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the

taking on such lands of fish and wildlife for other purposes. Whenever it is necessary to restrict the taking of populations of fish and wildlife on such lands for subsistence uses in order to protect the continued viability of such populations, or to continue such uses, such priority shall be implemented through appropriate limitations based on the application of the following criteria:

1. customary and direct dependence upon the populations as the mainstay of livelihood;
2. local residency; and
3. the availability of alternative resources."

These definitions and the recognition accorded subsistence uses in both federal and state laws are part of a long political controversy surrounding this issue which, over the last few years, has resulted in both a state subsistence law (1978), and more recently, the Alaska National Interest Lands or d-2 bill (1980). State law and the Alaska Department of Fish and Game (ADF&G) policy and regulations regarding subsistence hunting and fishing are discussed in the Special Report on the State Fish and Game Law, 1978. State-federal consistency and the implementation of fish and game regulations, now that the Alaska National Interest Lands bill has passed, are evolving amid controversy.

The importance of the Alaska National Interest Lands bill to the Norton Sound, Bering Strait, and Yukon Delta areas in particular will be profound, since millions of acres of local lands have been set aside in one of several federal conservation systems. Among them are the Bering Land Bridge Natural Preserve (2,457,000 acres) and the Bering Sea additions to the Alaska Maritime National Wildlife Range, which includes the following islands: Sledge, Bluff, Besboro, Egg, King, Punuk, and Fairway Rock. In the Yukon Delta area, approximately 13,400,000 acres have been added to the already existing Clarence Rhode National Wildlife Range system (see Section III.E.5. on Land Use).

The Inupiat and Yupik Eskimo people of the Norton Sound, Bering Strait, and Yukon Delta areas depend on the subsistence taking of fish, marine mammals, birds, whales, and other foods found locally, as their ancestors did for as long as the region has been humanly occupied. A Yupik Eskimo report entitled, Does One Way of Life Have to Die So That Another Can Live, eloquently states the importance of the Eskimo's cultural survival as imbedded in the subsistence way of life and each individual's personal relationship to the land, the sea, and the resources:

"Our area is not an economically developed area. We depend on the sea for our food and clothing. There is much sharing in the catches, as we realize the needs of our brothers and they realize our needs. It is not joyful to see our children and grandchildren hungry . . . If the law prohibits hunting of sea mammals at any time, the people will listen to the hunger of their families and hunt even against the law . . . Everyone of us is Eskimo around here. We all have to eat our own native food, and there is no question about it. We cannot possibly go without it . . . Please try to fathom our great desire to survive in a way somewhat different from yours, and thus see why the hunters will continue to go out." The elders of Nightmute, 1973. Refer to page 4 of Davidson (1974).

"Over long stretches of unrecorded time, Native Americans established balances with other life on the earth. They survived over the

> centuries by living in balance with the fish and birds and animals--in balance with the subsistence resources of the natural world. In no more than a fleeting moment in time, this balance has been torn apart wherever Europeans settled and civilized North America. When the balance, or circle of life as it has been called, is broken, birds and fish and animals begin disappearing from the land. When they are gone, so are the people who depended upon them." (Davidson, 1974, p. 5.)

The possible introduction of oil and gas activity in the Norton Sound, Bering Strait, and Yukon Delta areas raises this concern anew for the people of these areas. This is not to deny that people in this region do not wear jeans and other clothes of western manufacture; that they do not order out of Sears catalogs; or that they do not buy snowmachines, outboards, and rifles for their subsistence hunting and fishing activities. But the values they hold and the importance they place on sharing with family and village, and in continuing as a harmonious part of the ecosystem of which they are a part, is paramount. Language, culture, spiritual beliefs, customs, and respect for others and for oneself, are all tied into an integrated, holistic view of the world centered around the traditional hunting, fishing, and gathering way of life associated with their local resources. For these reasons, hunters or fishermen are the most respected leaders in the community; success at the hunt or at fishing directly influences one's standing in the community. Leadership in newer organizational forms tends to follow these traditional values and bases for respect so that success at hunting and fishing still provides the dominant structure around which the community and its people are organized.

The following discussion, drawing heavily on Ellanna, 1980, Technical Report No. 53, Vol. 1, focuses on the actual food hunted, fished, and gathered by local residents of the area. Further discussion of village ways of life and livelihood is found in Section III.B.4., Village Livelihood. Discussion of the historic sites and traditional hunting and fishing areas is found in Section III.E.1., Cultural Resources. Traditional population levels and settlement patterns associated with the subsistence lifestyle can be found in Section III.B.1., Population. For a discussion of the subsistence species utilized locally, refer to Sections III.C.2, Fish Resources; III.C.6., Endangered Species; III.C.4., Marine Mammals; and III.C.3., Birds.

Ellanna (1980) and others identified the following major ecological orientations within the Norton Sound/Yukon Delta area which characterize the residents' predominant subsistence patterns. (Refer to Table III.B.3.-1.) They are:

a. small sea mammal hunting, inland hunting, and fishing pattern: the contemporary communities of Shishmaref, Brevig Mission, Teller, and Mary's Igloo;

b. large sea mammal hunting pattern: the contemporary communities of Wales, Inalik (Little Diomede), King Island, Gambell, and Savoonga (St. Lawrence Island);

c. Norton Sound fishing and coastal and inland hunting pattern: the contemporary communities of Solomon, Golovin, White Mountain, Council, Elim, Koyuk, Shaktoolik, and Unalakleet;

Table III.B.3.-1
Seasonal Patterns of Utilization by
Village and Species: Norton Sound/Yukon Delta
1976-1980

a.
SMALL SEA MAMMAL, INLAND HUNTING, AND FISHING PATTERN
Shishmaref, Teller, Brevig Mission, and Mary's Igloo

Species	Seasons* Sp	Su	F	W	Villages Using
Fish:					
Herring	X		X	X	Teller, Shishmaref
Smelt	X	X	X	X	Teller, Shishmaref
Saffron Cod			X	X	Teller, Shishmaref
Whitefish Species	X	X	X	X	Shishmaref
Arctic Grayling		X	X		Teller, Shishmaref
Arctic Char		X	X		Teller, Shishmaref
Salmon	X	X			
Sea Mammals:					
Pacific Walrus	X	X			Shishmaref, Teller, Brevig Mission
Bearded Seal	X	X	X	X	Shishmaref, Teller, Brevig Mission
Harbor/Spotted Seal	X	X	X	X	Shishmaref, Teller, Brevig Mission
Ringed Seal	X	X	X	X	Shishmaref, Teller, Brevig Mission
Birds:					
Migratory Waterfowl	X	X	X		All Villages
Land Animals:					
Moose		X	X		All Villages
Ptarmigan			X	X	All Villages
Arctic Hare			X	X	All Villages
Other Resources					
Greens and Berries	X	X	X		All Villages

*Explanation of Seasons:
Sp = Spring
Su = Summer
F = Fall
W = Winter

Table III.B.3.-1
Seasonal Patterns of Utilization by
Village and Species: Norton Sound/Yukon Delta
1976-1980
continued

b.

LARGE SEA MAMMAL HUNTING PATTERN

Wales, Little Diomede, King, St. Lawrence, and Little Diomede Islanders in Nome, and Gambell and Savoonga on St. Lawrence Island

Species	Seasons* Sp	Su	F	W	Villages Using
Sea Mammals:					
Pacific Walrus	X	X	X	X	All Villages (Savoonga and possibly Gambell in winter)
Bearded Seal	X	X			King Island, Little Diomede
Bowhead Whale	X				Gambell, Savoonga, Diomede and Wales occasionally
Gray Whale	X	X			Gambell, Savoonga, others occasionally
Beluga Whale	X				Gambell, Savoonga
Minke Whale	X	X			Gambell, Savoonga
Spotted Seal			X		All Villages
Sea Lions			X		St. Lawrence Villages
Ringed Seal	X	?	X	X	All Villages
Fish and Shellfish:					
Salmon		X	X		All Villages
Crab	X			X	Gambell, Savoonga, L. Diomede, K.I. in Nome
Sculpin				X	Gambell, Savoonga
Tomcod	X			X	Gambell, Savoonga, subcommunities in Nome
Other Fish		X	X	X	All Villages
Birds:					
Migratory Waterfowl	X	X	X		King Islanders and Diomede and St. Lawrence Islanders in Nome, Teller
Land Animals:					
Moose		X	X		King Islanders and Diomede and St. Lawrence Islanders in Nome, Teller
Other Resources:					
Greens and Berries	X	X	X		King Islanders and Diomede and St. Lawrence Islanders in Nome, Teller

*Explanation of Seasons:
Sp = Spring
Su = Summer
F = Fall
W = Winter

Table III.B.3.-1
Seasonal Patterns of Utilization by
Village and Species: Norton Sound/Yukon Delta
1976-1980
continued

c.
NORTON SOUND FISHING AND COASTAL AND INLAND
HUNTING PATTERN
Nome, Solomon, Golovin, White Mountain, Council,
Elim, Koyuk, Shaktoolik, Unalakleet

Species	Seasons* Sp	Su	F	W	Villages Using
Fish and Shellfish:					
Salmon		X**	X		All Villages
Herring	X			X	Golovin, Moses Point, Elim, Shaktoolik, Unalakleet
Smelt	X	X		X	Elim, Moses Point, Koyuk, Shaktoolik?, Unalakleet
Tomcod	X		X	X	All Villages
Flounder		X			Elim Moses Point, Unalakleet
Arctic Grayling	X	X	X	X	Golovin, Nome, Elim, Moses Point, Shaktoolik, Unalakleet
Arctc Char	X	X	X	X	Golovin, Elim, Moses Point Shaktoolik, Unalakleet, Nome
Whitefish		X	X		Shaktoolik?, Unalakleet
Whitefish			X	X	Golovin, Elim, Moses Point
King Crab	X			X	Shaktoolik, Unalakleet, Nome, Golovin, Elim, White Mountain
Other Fish			X	X	All Villages
Sea Mammals:					
Beluga Whale	X	X	X		All Villages except Golovin, White Mountain, Nome, Council
Bearded Seal	X		X		All Villages
Spotted Seal	X		X		All Villages
Ringed Seal	X		X		All Villages
Pacific Walrus	X	X			Golovin, White Mountain, Elim, Nome Shaktoolik
Land Animals:					
Moose		X	X	X	Nome, Solomon, Council, White Mountain, Golovin, Elim, Koyuk, Shaktoolik
Caribou	X		X		Koyuk, Shaktoolik, Unalakleet, Elim?
Ptarmigan	X	X	X		All Villages
Birds:					
Migratory	X		X		All Villages

*Explanation of Seasons:
Sp = Spring
Su = Summer
F = Fall
W = Winter
**June-August

Table III.B.3.-1
Seasonal Patterns of Utilization by
Village and Species: Norton Sound/Yukon Delta
1976-1980
continued

d.

YUKON DELTA FISHING AND SMALL SEA MAMMAL HUNTING
St. Michael, Stebbins, Kotlik, Bill Moore's Slough, Hamilton, Emmonak, Alakanuk, Sheldon Point, Mountain Village, and to a Lesser Extent, St. Mary's

Species	Seasons* Sp	Su	F	W	Villages Using
Fish and Shellfish:					
Salmon-King Chum Silver and Pink					All Villages
Herring	X				Stebbins and St. Michael
Pike	X		X	X	Kotlik, St. Mary's
Smelt	X				All Villages
Tomcod				X	All Villages
Flounder		X		X	All Villages
Arctic Char		X	X	X	All Villages
Whitefish	X	X	X		All Villages
Sheefish	X		X	X	All Villages
Blackfish			X	X	All Villages
Other Fish	X		X	X	All Villages
Sea Mammals:					
Bearded Seal	X		X	X	Primarily St. Michael, Stebbins; also Yukon Delta Villagers Occasionally in fall and winter
Spotted Seal	X		X	X	Primarily St. Michael, Stebbins; also Yukon Delta Villagers Occasionally in fall and winter
Ringed Seal	X		X	X	Primarily St. Michael, Stebbins; also Yukon Delta Villagers Occasionally in fall and winter
Beluga Whale	X		X	X	All Villages
Pacific Walrus	X				St. Michael, Stebbins
Land Animals:					
Moose			X	X	All Villages
Caribou, Reindeer			X	X	All Villages, Reindeer all year for Stebbins
Arctic Hare	X				Yukon Delta Villages
Beaver			X	X	Yukon Delta Villages
Other Land Animals			X	X	All Villages
Birds:					
Migratory Waterfowl	X	X	X		All Villages
Other Resources:					
Greens and Berries	X	X	X		All Villages

*Explanation of Seasons:
Sp = Spring Su = Summer F = Fall W = Winter
**June-August

d. Yukon Delta fishing and small sea mammal hunting pattern: the contemporary communities of St. Michael, Stebbins, Kotlik, Bill Moore's Slough, Hamilton, Emmonak, Alakanuk, and Sheldon Point.

a. Small Sea Mammal Hunting, Inland Hunting, and Fishing Pattern (Shishmaref, Brevig Mission, Teller, and Mary's Igloo): At the northern perimeter of the proposed lease sale area, seals are a critical food source (both the meat and oil) with bearded seals (ugruk), ringed seals and spotted seals first, second, and third in harvest frequency and local preference. In Shishmaref, Ellanna reports 150 to 175 bearded seals with 800 to 1000 hair seals harvested per year in recent years. Other villages in this pattern harvest fewer seals than Shishmaref, but recent and accurate harvest figures are not available for these villages. Seal skins and gut are used locally for clothing and other home uses, as well as for crafts which are sold for cash. Walrus are hunted by residents of these villages, but the social and technological complexity of the hunt and number of walruses harvested are considerably less than for traditional walrus-dependent villages (Diomede, King, and St. Lawrence Islands). Migratory waterfowl are also important subsistence resources. Particularly in spring and summer, when winter food stocks are low, both birds and eggs are harvested. Fish are a primary subsistence resource to all these villages. Fish nets are set in the vicinity of the villages and at fish camps located all along the coast and up the drainages of major salmon streams. Salmon are dried during the July to August salmon runs for winter use and surplus, and they are sold for local cash or credit (Eisler, 1978). Additional species of fish (including herring, whitefish, arctic char, grayling, tomcod, smelt, flounder, and sculpin) are caught throughout the year, particularly in streams, bays, lagoons, and channels of the nearshore area (see Table III.B.3.-1 and Graphic No. 2C). Reindeer herding and moose hunting also provide an important local food source to these villages. With the decline of caribou in the 1800's, reindeer herding was introduced to the Seward Peninsula and is still an important and meaningful part of the economy and culture of many Bering Strait villages, including Teller and Brevig Mission. Greens and berries provide nutritional variety and balance to local diets.

Ellanna (1980) estimates that approximately 75-80 percent of the total protein, fats, and vegetation for residents of Shishmaref come from local subsistence resources. Teller's longer history of contact with mining activities, commercial reindeer herding, and wage employment is associated with less subsistence dependence and perhaps some loss of subsistence knowledge over time. While Brevig Mission's poor cash resources affect subsistence use and take, they increase the actual need for these resources (Ellanna, 1980, pp. 256-257). See also Section III.B.4. on village livelihood.

b. Large Sea Mammal Hunting Pattern (Little Diomede; King Islanders in Nome, Gambell, Savoonga on St. Lawrence Island, and Wales): Unquestionably, the open skinboat (umiak) hunting of the Pacific walrus is economically and culturally the most important subsistence activity of the populations within this subregional grouping. The residents of St. Lawrence Island contemporarily practice bowhead whaling to a degree much greater than Little Diomede and Wales; and they are currently deeply involved with the Alaskan Eskimo struggle against the International Whaling Commission to retain their rights to whaling for economic, social, and cultural reasons. However, walrus hunting even for this group is economically a priority (Ellanna, 1980,

pp. 260-261; see also Table III.B.3.-2). Walrus are taken primarily in the spring during their migration north from wintering areas in the Bering Sea. Hunting begins from late March or early April for St. Lawrence Island to as late as early July for Little Diomede, King Island, and Wales. iFrst cows and calves and later bulls and barren cows are hunted primarily in open water at ice leads or near broken ice. Since cowhides are the only suitable hide for covering the skinboat or umiak, cows are critical objects of the hunt. Bull walrus, too, are highly prized for their ivory, an important craft and cash resource for all of these villages. Walrus meat is frozen or is dried, fermented, and stored in oil (EWC Report, 1980, p. 8). Other walrus byproducts provide rawhide line for household use and drum heads for ceremonial occasions and dancing.

Walrus are hunted as a cooperative rather than individual activity by a crew ranging from seven to ten men which is directed by a skinboat captain. Personal interrelationships, social factions, economic distribution, and well-being are all related to the skinboat-crew composition and the success of the hunt. Recent changes in technology, particularly the increased use of aluminum boats, has introduced some social changes associated with the hunt and its distribution. See Ellanna (1980) and EWC Report (1980).

Bowhead whaling is the most prestigious and culturally important activity for the people of St. Lawrence Island today. It is an important link between these Siberian Yupik Eskimo, the northern Inupiat of villages along the North Slope and the Canadian Beaufort Sea, and the Greenland Eskimo. The political controversy associated with quotas set by the International Whaling Commission and the continued attempts to encourage or force compliance with these quotas is beyond the scope of this environmental impact statement. See Beaufort Sea FEIS, 1979; Worl Associates, 1978; Rosita Worl, 1980; Tom Lowenstein, 1980; the North Slope Borough CZM Newsletter; Anchorage Daily News; and the Anchorage Times for additional information on this controversy and its meaning. See also Table III.B.3.-2, based on a recent survey in the Bering Strait region, which ranks the preferences of Gambell and Savoonga residents for large sea mammals available locally. Bowheads are hunted in spring on their northern migration. Like walrus hunting, whaling is a complex cooperative effort utilizing skinboats. It is the basis of an elaborate food distribution system and has enormous cultural significance for the whole village. In the opinion of local residents, no other food source, including other kinds of whale, can adequately compensate for the bowhead whale. However, the gray, beluga, and minke whales are also hunted. Whaling as an activity is at the core of St. Lawrence Island culture (Ellanna, 1980, pp. 269-270).

Other sea mammals, including three species of seals, are also used, as well as fish and shellfish. Migratory birds, eggs, berries, and vegetation are important supplements to sea mammal dependence; and Wales and St. Lawrence Island residents are also dependent upon local reindeer herds. See Graphics Nos. 2A, 2B, and 2C.

c. Norton Sound Fishing and Coastal and Inland Hunting Pattern (Solomon, Golovin, White Mountain, Council, Elim, Koyuk, Shaktoolik, Unalakleet, and Part of Nome's Population): This diverse group of villages is unified around a wide variety of subsistence resources in the Norton Sound area. Overlapping subsistence use areas encompass the area just east of Nome

Table III.B.3.-2

Rank Order of Primary Subsistence Species for
Selected Bering Strait Villages

	Gambell	Savoonga	Little Diomede	Wales
Walrus	1	1	1	1
Black Whale (bowhead)	1.5	1	-	2
Gray Whale	3	5	-	3
Oogruk (bearded seal)	2	3	3	2
Seal	3	4	2	3
Beluga Whale	5	7	-	4
Polar Bear	6	6	4	4

Source: Alaska Eskimo Walrus Commission Final Report, "Use and Dependence Upon Walrus in the Bering Straits and Norton Sound Areas, for Kawerak, Inc., June 1980, p. 7.

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Published February 1982

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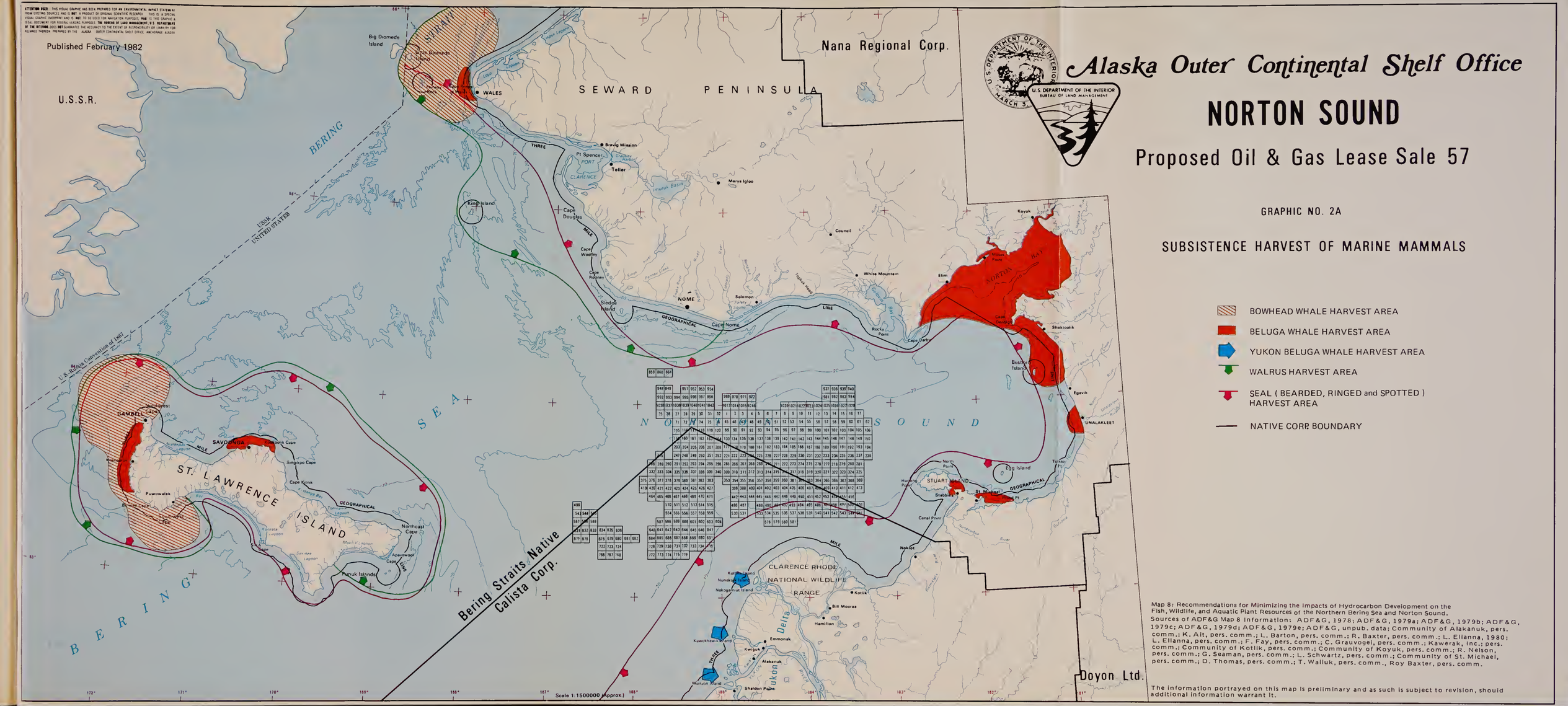
NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 2A

SUBSISTENCE HARVEST OF MARINE MAMMALS

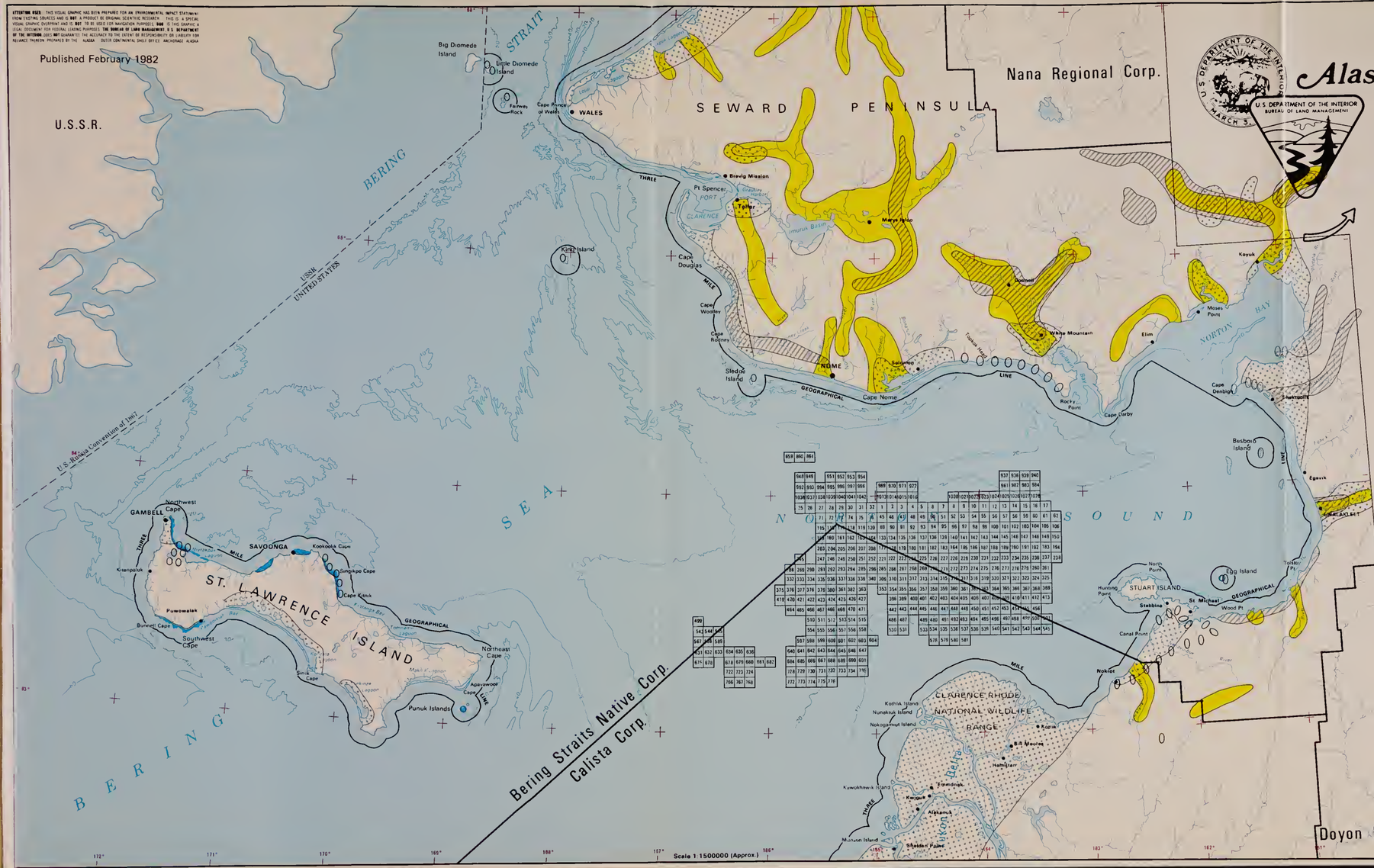


- BOWHEAD WHALE HARVEST AREA
- BELUGA WHALE HARVEST AREA
- YUKON BELUGA WHALE HARVEST AREA
- WALRUS HARVEST AREA
- SEAL (BEARDED, RINGED and SPOTTED) HARVEST AREA
- NATIVE CORP BOUNDARY

Map 8: Recommendations for Minimizing the Impacts of Hydrocarbon Development on the Fish, Wildlife, and Aquatic Plant Resources of the Northern Bering Sea and Norton Sound.

Sources of ADF&G Map 8 Information: ADF&G, 1978; ADF&G, 1979a; ADF&G, 1979b; ADF&G, 1979c; ADF&G, 1979d; ADF&G, 1979e; ADF&G, unpub. data; Community of Alakanuk, pers. comm.; K. Ait, pers. comm.; L. Barton, pers. comm.; R. Baxter, pers. comm.; L. Ellanna, 1980; L. Ellanna, pers. comm.; F. Fay, pers. comm.; C. Grauvogel, pers. comm.; Kawerak, Inc.; pers. comm.; Community of Kotlik, pers. comm.; Community of Koyuk, pers. comm.; R. Nelson, pers. comm.; G. Seaman, pers. comm.; L. Schwartz, pers. comm.; Community of St. Michael, pers. comm.; D. Thomas, pers. comm.; T. Walluk, pers. comm., Roy Baxter, pers. comm.

The information portrayed on this map is preliminary and as such is subject to revision, should additional information warrant it.



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BUREAU OF LAND MANAGEMENT

Alaska Outer Continental Shelf Office

NORTON SOUND

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GRAPHIC NO. 2B

SUBSISTENCE HARVEST OF BIRDS AND TERRESTRIAL MAMMALS

- MOOSE HARVEST AREA
- CARIBOU HARVEST AREA
- GRIZZLY BEAR HARVEST AREA
- WATERFOWL HARVEST AREA
- SEABIRD HARVEST AREA
- EGG HARVEST AREA

Source: See Graphic 2A

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U.S.S.R.

BERING STRAIT

Big Diomede Island

Little Diomede Island

Fairway Rock

Cape Prince of Wales

WALES

SEWARD PENINSULA

Nana Regional Corp.

BERING SEA

BERING

U.S.S.R. — U.S. 1990 Convention Line

Brevig Mission

Pt Spencer

Taller

Marys Igloo

King Island

Cape Douglas

Cape Woolley

Cape Rodney

Sledge Island

NOME

Solomon

Council

Koyuk

Moses Point

NORTON BAY

White Mountain

Elim

Cape Nome

Nome Port

Cape Darby

Cape Denbigh

Shaktoolik

Besboro Island

Egavik

UNALAKLEET

GAMBELL

Northwest Cape

SAVOONGA

Kookoolik Cape

Singakpo Cape

Cape Kotnik

Kiwenpauk

Puwowalak

Bunnell Cape

Southwest Cape

ST. LAWRENCE ISLAND

Northeast Cape

Sinuk Cape

Hanawoolt Lagoon

Punuk Islands

Egg Island

Humboldt Point

STUART ISLAND

Stebbins

Ft. Michael

Canal Point

Nukluk

Bering Straits Native Corp.

Calista Corp.

CLARENCE RHODE NATIONAL WILDLIFE RANGE

Kotlik

Bill Moores

Hamilton

Kwukhpak

Emmonak

Kwigluk

Alakanuk

Yukon Delta

Sheldon Point

Doyon Ltd.

Scale 1:1500000 (Approx.)

Alaska Outer Continental Shelf Office

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MARCH 3, 1849

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 2C

SUBSISTENCE AND COMMERCIAL HARVEST OF FISH AND SHELLFISH

- SUBSISTENCE FISHING
- SUBSISTENCE & SPORT FISHING
- SUBSISTENCE & COMMERCIAL FISHING
- COMMERCIAL HERRING HARVEST AREA
- WINTER HERRING HARVEST AREA
- COMMERCIAL KING CRAB CONCENTRATED HARVEST AREA
- SUBSISTENCE KING CRAB HARVEST AREA
- CLAM HARVEST AREA
- FRESHWATER MUSSEL HARVEST AREA
- NATIVE CORP BOUNDARY

Source: See Graphic 2A

(Nome River) to Point Romanof, which separates this pattern of use from the Yukon Delta pattern. In winter, when shorefast ice permits extensive travel, as far as 20 to 30 miles offshore in Norton Sound is added to normal subsistence-use areas closer to individual villages.

Salmon, particularly pink, chum, and king, are the most important cash resource for this area and are a critical subsistence resource as well. It is not uncommon for area residents to participate in both subsistence and commercial salmon fishing at the same site during the same week. Salmon fishing occurs during the early June-August period and constitutes approximately 35-40 percent of the total diet of the residents of these villages (Ellanna, 1980). Beach seining and gill netting for herring are also important subsistence activities, as herring is a staple of residents of Golovin, Elim, Moses Point, Shaktoolik, and Unalakleet. Barton (1978) reports that from 1975-1978 Shaktoolik and Unalakleet harvested an average of 300 pounds of herring for subsistence and the villages of Golovin and Elim harvested a 150-point average. (See also Hemming, Harrison, and Braund, 1978.)

Other fish and shellfish of importance to villages along Norton Sound are crab, whitefish, grayling, arctic char, smelt, burbot, tomcod, pike, sheefish, halibut, lamprey, suckers, blackfish, stickleback, chub, sculpin, and clams. (See Graphic No. 2C.) Small sea mammals including beluga whales and bearded, spotted, and ringed seals are hunted by boat in open water, particularly in spring and fall, and are estimated to comprise 15-20 percent of the local diet in this area (Ellanna, 1980). Other important subsistence resources are moose (particularly for Nome, Council, Solomon, and White Mountain residents) and caribou (especially for residents of Shaktoolik, Unalakleet, and Koyuk). Migratory birds in spring and fall, along with eggs and fledglings, are eagerly anticipated and prized subsistence foods. Ellanna estimates that 80-90 percent of Norton Sound village diet is by local acquisition with between 50-75 percent of this total from marine resources. (See also commercial fishing, Section III.C.2.)

d. Yukon Delta Fishing and Small Sea Mammal Hunting Pattern (St. Michael, Stebbins, Kotlik, Bill Moore's Slough, Hamilton, Emmonak, Alakanuk, Sheldon Point, Mountain Village, and St. Mary's): Residents of villages in this pattern are primarily fishermen, although hunting for waterfowl and land and sea mammals is also important. Chum, king, silver, and pink salmon are both commercially important as major sources of cash and are also primary subsistance resources for all Yukon Delta villages. Sheefish, broad whitefish, Bering Cisco, saffron cod, pike and burbot are important fish resources for all of these villages. In between intensive fishing periods, Yukon Delta residents hunt sea mammals, particularly beluga whales bearded, spotted, and ringed seals. Stebbins and St. Michael residents also hunt walrus, which is only occasionally sought by other Delta villagers. According to Wolf, Stebbins fishermen also depend on starry flounders, sculpin, lush, trout, "needlefish," and grayling, caught in summer in rivers south of Stebbins. Clams and mussels are also harvested by Stebbins residents before freezeup. In fall and winter, hunting parties from all Yukon Delta villages range into the Andreavsky Mountains for moose and caribou. Stebbins Native Corporation maintains two reindeer herds from which Stebbins residents obtain meat year-round (Wolf, 1981).

The importance of salmon to villages in this pattern cannot be underestimated. AVCP estimates that for coastal villages, 30-40 percent of local diet and 70-85 percent of total cash needed to purchase subsistence equipment is obtained from salmon fishing (Ellanna, 1980). Most residents of Delta villages build and maintain their own wooden boats which are used for fishing and waterfowl and sea mammal hunting. Most salmon are taken by gill or set net. Various types of nets, traps, and hooks are used for other fish, depending on the season, fish, and other factors. Rifles, harpoons, and nets are used to harvest sea mammals, while traps, snares and rifles are used to hunt land animals. Migratory waterfowl and their eggs are an important source of food for all Yukon Delta fishing villages.

> "Besides providing meat for food and skins for clothing, waterfowl have always been deeply involved in Native folklore and mythology. Bird beaks, bones, and feathers adorn ceremonial dress and masks, and the lore of birds is prominent in stories of Eskimo ancestors" (Davidson, 1974, p. 49).

For St. Michael and Stebbins, herring are a primary source of cash, harvested locally in Spring. Subsistence dependence on herring for year-round use and for trade and barter is also great.

Table III.B.4.-1 provides a breakdown of subsistence calendar harvest data for three Yukon Delta villages--Kotlik, Emmonak, and Alakanuk--compiled by AVCP from 1974 and 1976 calendars kept by village residents. The extent of dependence on local resources and variability in harvests for these 2 years are both noteworthy.

Table III.B.4.-2 summarizes subsistence harvest information for the entire lease sale area, based on Selkregg, 1976.

4. Village Livelihood: Modern subsistence ways of life depend on a certain amount of cash, usually from wages, state or federal transfer payments, and/or a combined family strategy in which one family member works while another engages in seasonal subsistence activities. In villages with commercial fishing incomes (Yukon Delta communities, Elim, Unalakleet, Golovin, Moses Point, Shaktoolik, Koyuk, Stebbins, and St. Michael), cash from commercial fishing can be used to obtain the subsistence technology necessary to maintain life on a year-round basis. In villages dependent upon walrus,

whale, or seals, ivory craftsmanship, skin sewing, and sales form a part of many villagers' cash resources. Seasonal jobs in construction, firefighting, or fish processing are additional sources of wage labor which still permit seasonal subsistence activities. Where these jobs are not available, or during periods of locally declining resources, welfare payments and food stamp programs provide cash and help to purchase ammunition and gear for subsistence pursuits.

Data on village level income and its relationship to subsistence activities and village family living patterns is incomplete for the Norton lease sale area. The Kawarek, Inc., OEDP report provides information for Gambell and Savoonga, as does the Alaska Eskimo Walrus Commission Subsistence survey. Village profiles and ADF&G Subsistence Division reports provide information on Yukon Delta villages. These studies will be used here to provide examples and to

Table III.B.4.-1
Summary of Subsistence Calendar Harvest
For Three Yukon River Delta Villages, 1974 and 1976

Village	Number of Households*	Pounds Per Village	Pounds Per Family	Fish	Land Mammals	Sea Mammals	Birds	Vegetables
Kotlik								
1974	35	550,036	14,616	525,131	13,533	6,020	2,767	12,486
1976	37	498,500	13,473	400,000	16,280	34,140	27,280	20,800
% 1974/1976				81.6/80.2	15.6/3.2	.07/6.8	.2/5.6	1.4/4.2
Emmonak								
1974	71	550,036	3,712	171,423	20,662	30,530	33,847	7,100
1976	75	820,500	10,807	601,000	37,800	81,700	58,600	41,400
% 1974/1976				65.1/73.3	7.8/4.6	11.6/10.0	12.8/7.1	2.7/5.0
Alakanuk								
1974	82	357,200	4,355	212,840	23,560	79,600	19,850	21,350
1976	83	906,750	10,924	680,910	41,200	92,400	45,540	46,700
% 1974/1976				59.6/75.2	6.6/4.5	22.3/10.2	5.6/5.0	6.0/5.2

Source: Association of Village Council Presidents and Nunam Kitlutsisti, Subsistence Food Harvest Yukon-Kuskokwim Delta: 1974 and 1976, a compilation by individual village families of food harvested each day and recorded on calendars.

* In some cases, numbers of households sampled is small. Plans are to update this calendar data in 1981 (Harold Sparck, personal communication, December 12, 1980).

Table III.B.4.-2
Geographic Patterns of the Use of Subsistence Resources
in the Norton Sound Region[1]

Village Area	Average & Range Percent Utilization				Average & Range Total Kg/person
	Mammals	Fish	Fowl	Plants	
Offshore Islands[2]	90.9 (73.7-98.8)	5.4 (0.4-15.7)	1.7 (0.6- 3.3)	2.0 (0.1- 7.2)	1,149.1 (308.1-2,946.2)
Bering Strait[3]	94.2 (91.9-97.1)	2.1 (1.3- 2.6)	0.5 (0.4- 0.5)	3.2 (1.1- 4.9)	841.3 (544.8-1,137.0)
Seward Peninsula[4]	56.7 (28.9-76.4)	30.4 (14.9-53.7)	2.3 (1.8- 3.1)	10.6 (6.8-15.5)	182.8 (153.2-238.4)
Norton Sound[5]	45.9 (30.4-63.5)	38.9 (16.6-52.8)	10.8 (1.5-27.6)	4.4 (1.1- 9.5)	333.5 (173.7-661.7)

1 Source: adapted from data collected by the Northwest Alaska Native Association as presented in Selkregg, 1976, p. 199.
2 Diomede, Gambell, Savoonga, and King Island.
3 Shishmaref and Wales.
4 Teller, Brevig Mission, and Nome.
5 Elim, Golovin, Koyuk, White Mountain, Shaktoolik, Unalakleet, Stebbins, and St. Michael.

supplement Nome and Wade Hampton census division data on personal income. This data is biased in favor of Nome and Bethel population centers and consequently overestimate levels of living at the village level.

Table III.B.4.-3 compares per capita personal income figures for the Nome and Wade Hampton Census Divisions to average U.S. per capita income. Figures in Row 5 show that per capita income in the Nome census division was only 84 percent as high as average U.S. per capita income in 1978. They also show that in the Wade Hampton census division, per capita income was only 37 percent of the average U.S. figure. These comparisons are based on income figures which are not adjusted for differences in living costs. However, Row 6 of Table III.B.4.-3 compares per capita incomes after adjusting for the extremely high living costs in the Nome and Wade Hampton census divisions. These costs have recently been estimated at more than twice as high as average U.S. living costs. In 1978, the living-cost-adjusted per capita income in Nome was 36 percent of average U.S. per capita income, and the living-cost-adjusted per capita income in Wade Hampton was only 16 percent of average U.S. per capita income. The Nome and Wade Hampton income figures do not include an estimate of the value of food obtained from subsistence activities, including hunting and fishing. With escalating fuel prices and potentially declining CETA and other federally funded employment, residents of this area could be severely stressed in their ability to afford minimal fuel necessary to heat homes and provide transportation to engage in subsistence hunting and fishing. This point is underscored by recent statistics on fuel price increases per village, which show substantial increases in just 1 year, 1979 to 1980, in home heating oil and motor gas prices. (Tables III.B.4.-4 and III.B.4.-5.)

Table III.B.4.-4 statistics indicate that Nome electricity prices are five times that of Anchorage, heating oil prices are one and one-third times those of Anchorage, and lumber costs are almost two times that of Anchorage prices. Compared with U.S. standards, these costs are even more inflated. Similarly, Bethel (Wade Hampton CD) prices range from 98 to 412 percent of Anchorage prices for electricity, heating and motor fuel, and lumber.

Table III.B.4.-5 which provides 1979-1980 fuel-cost comparisons for selected communities in the area, shows increases averaging 25 percent in 1 year for bulk fuel delivered. For the most part, villages in the region obtain fuel from Nome, St. Michael, or Unalakleet, with prices varying according to source of supply.

Table III.B.4.-6 provides a job breakdown for commercial fishing permits and other employment in the Yukon Delta area. Table III.B.4.-7 shows permanent Native employment on St. Lawrence Island for 1979. These tables indicate the extremely limited number of permanent jobs per community in this proposed lease sale area and, thus, the limited job-produced cash available locally. Statistics on 1980 state welfare payments, shown in Table III.B.4.-8, indicate another source of cash to the area. Not shown are BIA public assistance payments as well as jobs in construction and firefighting which require temporary relocation by village residents.

Reductions in welfare programs, food stamps, and CETA programs are affecting many villages in this area which depend on these programs and jobs for most of their cash resources. Reductions in medical assistance programs are also just being felt with new 1982 fiscal year cuts in effect. (Anchorage Times, No-

Table III.B.4.-3

Per Capita Personal Income in Nome and
Wade Hampton Census Divisions,
1971, 1975, and 1978
Compared with U.S. Per Capita Incomes

	Nome CD		Wade Hampton CD	
	1971	1978	1971	1978
(1) Per Capita Personal Income, unadjusted	2,819	6,615	1,797	2,938
(2) Adjusted by ratio of living costs in area to U.S. average	1,253	2,839	781	1,234
(3) Ratio of Census Division family budget requirements to average U.S. family budget requirements	2.25	2.33	2.30	2.38
(4) U.S. Per Capita Income	4,166	7,846	4,166	7,846
(5) Ratio: Unadjusted Nome and Wade Hampton Per Capita Incomes to U.S. Per Capita Incomes	0.68	0.84	0.43	0.37
(6) Ratio: Nome and Wade Hampton per Capita Incomes to U.S. Per Capita Income, After Adjustment for Living Cost Differences	0.30	0.36	0.19	0.16

Note: For detailed information concerning sources and definitions of figures presented in this analysis, see notes to Table III.D.2.f.-1.

Source: U.S. Bureau of Economic Analysis and Alaska Department of Commerce and Economic Development, Numbers: Basic Economic Statistics of Alaska Census Division (November 1979).

Table III.B.4.-4

ENERGY AND LUMBER COSTS IN DECEMBER 1979
COMPARISONS OF ANCHORAGE TO OTHER ALASKAN COMMUNITIES

	Anchorage	Barrow	Bethel	Fairbanks	Homer	Juneau	Kenai	Nome	Petersburg	Soldotna
Electricity (1,000 kwh)	$32.00	$121.55	$131.80	$70.44	$45.98	NA	$45.98	$170.00	NA	$45.98
Percent of Anchorage	100	380	412	220	144	NA	144	531	NA	144
Heating Oil (55 gal)	45.10	92.40	48.40	44.18	36.85	45.10	36.85	58.85	44.00	35.75
Percent of Anchorage	100	205	107	98	82	100	82	130	98	79
Gasoline, Auto (55 gal)	58.30	95.70	57.20	66.00	66.55	55.18	68.20	64.90	55.00	63.80
Percent of Anchorage	100	164	98	113	114	95	117	111	94	109
Lumber (2"x4"x8")	2.56	5.00	3.39	2.37	2.00	2.40	2.10	4.50	NA	2.00
Percent of Anchorage	100	195	132	93	78	94	82	176	NA	68

NA = Not available.

Source: Cooperative Extension Service, University of Alaska; and the U.S. Department of Agriculture, reprinted in the *Alaska Statistical Review*, 1980, Alaska Department of Commerce and Economic Development, Division of Economic Enterprise.

Table III.B.4.-5

Costs[1/] of Heating Fuel and Motor Gas
In 1979 and 1980
In Selected Norton Sound, Yukon Delta Communities

Community	1979		1980		Average % Change
	Oil	Motor Gas	Oil	Motor Gas	
Emmonak	1.06	1.10	1.36	1.41	28.5
Gambell	1.25	1.27	1.54	1.57	23.2
Golovin	1.14	1.16	1.42	1.44	24.5
Kotlik	1.01	1.05	1.31	1.36	30.0
Nome	*	*	*	*	*
Shaktoolik	1.01	1.47	1.26	1.31	25.0
Unalakleet	*	*	2.34	*	*

*Data not available.

1/ Bulk price delivered, per gallon, in dollars.

Source: Energy Department, Rural Alaska Community Action Program, Inc., Energy Profile of Alaska, September 1980.

Table III.B.4.-6

Commercial Fishing Permits
And Other Employment, Yukon Delta Area, 1979

Subdistrict Yukon Delta 334-10, 20 & 30	Residence	Gill Net Permits	Processing	Other Jobs
	Emmonak	113	280	55
	Mt. Village	112	--	70
	Alakanuk	95	--	65
	Kotlik	81	8	40
	St. Mary's	63	35	110
	Sheldon Point	22	--	10
	Unalakleet	14	--	--
	Stebbins	8	--	--
	Shaktoolik	3	--	--
	St. Michael	1	--	--
	Other Residences	214	--	--
	TOTAL:	726		

Source: Alaska Department of Fish and Game, Division of Commercial Fisheries, Annual Management Report, 1979, Yukon Area. Table 6, and Darbyshire and Associates, Lower Yukon *Community Profiles: A Background for Planning*, December 1979.

Note: A multiplier of 1.5 should be added to permit figures to accurately portray fishing employment (E. Orbeck, Alaska Department of Labor, 1981).

Also refer to Tables III.D.2.d.-1 and -2.

Table III.B.4.-7

PERMANENT NATIVE EMPLOYMENT ON ST. LAWRENCE ISLAND, 1979

Occupation and Job Category		Gambell	Savoonga
City Government			
Assistant/Clerical	12 Mo.	1	1
Magistrate	12 Mo.	1	1
Custodian	12 Mo.	1	1
Police Force	12 Mo.	3	3
CETA Coordinator	12 Mo.	1	1
National Guard	Weekly Drills	38	23
U.S. Post Office	12 Mo.	2	2
USPHS Health Clinic			
Health Aides	12 Mo.	3	3
Custodian	12 Mo.	1	1
Headstart-Preschool	9 Mo.	3	4
Kindergarten/Elementary			
Teachers	12 Mo.	1	1
Teacher Aides	9 Mo.	9	12
Cooks/Helpers	9 Mo.	2	2
Custodians	12 Mo.	2	3
High School			
Bilingual Aides	9 Mo.	2	2
Spec. Ed., Rec. Dir.	9 Mo.	3	2
Custodian	9 Mo.	1	2
Village Corporations	12 Mo.	2	2
IRA Councils	12 Mo.	2	2
AVEC Operators	12 Mo.	2	2
Airline Agent	12 Mo.	1	1
Airport Manager	12 Mo.	1	1
Private Stores, Coffee Shops, Lodging		3	3
Native Store (ANICA)			
Manager	12 Mo.	1	1
Assistants	12 Mo.	2	8
Part time workers	Part time	2	X
Reindeer herders	Part time	X	3
TOTAL JOBS:		90	87

Source: OEDP Committee, Kawarek, Inc., Bering Straits: An Overall Economic Development Plan; March 1980.

Table III.B.4.-8

ALASKA PUBLIC ASSISTANCE AND FOOD STAMP DISBURSEMENTS, 1980, IN BERING STRAIT, NORTON SOUND, AND YUKON DELTA AREAS

		No. Cases	Annual Payments[a]
I	Bering Strait	46	$179,424
II	Norton Sound	191	$513,972
III	Yukon Delta	112	$445,608

a. Annual average based on October, 1980, disbursements by Alaska Department of Health and Social Services, Division of Public Assistance. Note: This annual average may slightly exaggerate annual payments if summer dependence drops off.

Definitions:

Bering Strait villages include Gambell, Savoonga, and Diomede.

Norton Sound villages include Shishmaref, Wales, Brevig Mission, Teller, Nome, Solomon, Council, White Mountain, Golovin, Elim, Koyuk, Shaktoolik, and Unalakleet.

Yukon Delta villages include Saint Michael, Stebbins, Kotlik, Emmonak, and Alakanuk.

vember 4, 1981.) Rising fuel costs would most affect those villages that travel the greatest distances in search of food resources (Savoonga, King Islanders, Stebbins, and Mountain Village) or whose present range becomes depleted through competition or habitat disturbance (Solomon, Nome, Teller, and Brevig Mission).

For further discussion of village livelihood in the area of call, see Kawerak, Inc., 1979; OEDP Report, 1980; Kawerak, Inc., Alaska Eskimo Walrus Commission Final Report, 1980; Darbyshire and Associates, 1979; Ellanna, 1980; Environmental Services, Ltd., 1980; Wolf, 1981; and Sparck, no date; and Sparck, no date.

5. Nome Community Infrastructure: The source of information for the following discussion is Policy Analysts, Limited (1980), Technical Report No. 53.

a. Municipal Government: Nome is a first class city located outside an organized borough. Title 29 of the Alaska Statutes grants first class cities limited authority to levy sales and property taxes. The City of Nome exercises this authority and all the powers of a first-class city including education (services not budgeted from the general fund). During FY 1980, the City of Nome anticipated expenditures of approximately $1,803,684, or $624 for each resident. On the revenue side, taxes are the largest source of income to the city general fund. Property taxes, including payments from public agencies in lieu of property taxes, account for 33 percent of expected income. Sales taxes, including all tax penalties and interest on delinquent taxes, account for 25 percent of FY 1980 budgeted income; and intergovernmental transfers account for 26 percent (state and federal revenue sharing as well as federal programs).

In 1978, Nome had almost 36 million dollars (full value determined by the state, in contrast to a 29-million-dollar local estimated value) of private real property ($12,402 per capita). Nome has $770,000 of general obligation bonded debt. This represents 2.14 percent of the city's assessed value. (State law prohibits any city from encumbering General Obligation (GO) debts in excess of 15 percent of its assessed value.)

b. Education: Most of Nome's students (kindergarten through twelfth grades) attend public schools under the jurisdiction of the Nome

school district. The district covers an area which is contiguous with the city of Nome boundaries. There are no private educational facilities serving this age group in Nome, though there is a private pre-school.

The student enrollment in Nome has been fairly constant through the years, except for the loss of approximately 200 boarding school students who returned to their villages over a 2-year period when the Bering Straits Regional Attendance Area was established in 1975. Enrollment in 1978-1979 was approximately 779, of which 404 attended elementary grades and 375 attended junior or senior high school. The district's FY 1980 enrollment projection was 800 students.

The school district presently maintains a student to teacher ratio of 11.6 in the elementary grades and 11.2 in the junior and senior high school grades. In

1979, the elementary grades had 37 certified teachers and the junior/senior high program employed 29 regular teachers.

To accommodate the student enrollment, schools are maintained at two sites. The three adjoining elementary buildings, constituting 64,000 square feet on the west end of town, are in a crowded land-use location. The 1935 classroom and gymnasium is dilapidated but heavily used. The 1955 structure of reinforced concrete has experienced differential settlement, and structural distress is apparent. The 1970 addition, a wood-frame and structually adequate facility, is composed of 31 classrooms, a resource center, a gymnasium, and a multi-purpose room in the elementary building. All are in use due to specialized program development. The junior and senior high school is located at the Nome-Beltz facility. The high school has 11 classrooms as well as a biology lab, music room and studies, library, kitchen/dining facility, home economics room, and administrative offices; vocational-technical facilities; a gymnasium; cafeteria/kitchen; and a dormitory which includes two horticultural classrooms. This space totals 62,700 square feet plus 11,700 square feet in the gymnasium.

In planning for future facilities, the educational report calls for a new junior high facility and a swimming pool in 1980. The two older elementary buildings would be razed in 1985 and new elementary facilities would be constructed on the present site and on dedicated land on the other side of town. The high school would have additions by 1985. These additions are projected to meet needs through 1987. Despite the high use of present space, the superintendent believes the present facilities are capable of handling substantial enrollment increases.

In 1978-1979, the district approved 2.7 million dollars in expenditures, or $4,771 per student. Though enrollments have slipped, costs continue to rise to maintain programs and cover the cost of inflation. In terms of revenue, the most of the money comes through state revenue (83 percent), while only 5 percent is derived from local taxation. A significant portion of Nome's budget is comprised of supplemental, categorical funds through state and federal sources. In 1978-1979, this counted for 32 percent of total spending.

c. Public Safety: The Nome Police Department is presently housed in the same building as the fire department and is located in the downtown core area of Nome. The department employs seven sworn officers. All service requests of the police, fire, and emergency medical (ambulance) are

currently processed through the Nome police dispatch. As well as performing normal duties, the Nome Police Department is responsible for airport security. The department recently added a patrolman to the work force which has benefitted the level of effectiveness. Ideally, with the workload that the department presently faces, an additional one to two patrolmen could be used.

The headquarters for F Detachment of the Alaska State Troopers, as well as the Nome post, is located in Nome. The Post provides law enforcement services to all the communities in the Nome region, excluding Nome. To serve the area, the Alaska State Troopers employ five sworn troopers. As well as their regular duties, the detachment is presently working on a new program with a non-profit corporation for the region in training village officers. The goal of the program, which is 12 weeks in length, is to impart procedural skills for small

misdemeanor cases. The training should assist the troopers in the workload for the region by freeing them of the responsibility of less serious misdemeanor cases.

The Nome Police Department and the Alaska State Troopers use the state jail system located in the downtown core area of Nome. The facility has one dormitory with ten beds, one dormitory with twenty beds, and eight cell beds. The jail also maintains two cells for use in alcohol detention. The state is designing a new regional detention facility which has been recommended for construction by the Nome Planning Commission.

The Department of Health and Social Services is presently at the planning stage for new or upgraded correctional facilities across the state. The master plan has targeted Nome for a new facility between 1983 and 1985. The size of a new jail will depend on use rates over the next several years.

The city of Nome, which is authorized to have a volunteer force of 40, presently provides fire protection through a volunteer force of 35 trained firemen. Five of these firemen are emergency medical technicians, three are licensed emergency medical technician instructors, and the remainder of the force is trained in first aid. The fire station is centrally housed in the downtown core area and presently has a response time of less than 3 minutes. The Insurance Service Office ratings for grading fire defenses for communities presently rate Nome as class 7 and class 9. Equipment available for use in extinquishing fires are two multi-purpose fire apparatus with a water capacity of 800 gallons and a foam capacity of 50 gallons each. The department has recently acquired a snorkel which has a water capacity of 500 gallons and a foam capacity of 50 gallons. In addition, there are three large water tankers available with a total water capacity of 3,500 gallons. The department also owns and operates an emergency rescue vehicle with extraction equipment which responds to traffic accidents.

d. Utilities: Nome's water system is a city owned and operated utility. The system was initially designed in 1963 and has subsequently developed to provide services to 711 customers. Water is delivered by municipal trucks to 193 customers (ESL 1981a).

The present water source is an infiltration gallery located 4 miles north of Nome at Moonlight Springs. The maximum yield of this water source has been calculated at about 1136 to 1138 liters (300 to 380 gal) per minute, which is considerably greater than the requirements for an adequate water supply. The water quality is considered excellent but is classified as hard water due to the calcium carbonate content.

Based on the approximate town water use of 760,785 liters (201,000 gal) per day, the reservoir has the capacity to provide a reserve of 1.5 days. Three days is considered a minimum amount for reserve purposes, which indicates an inadequacy in this portion of Nome's water system.

Total water consumption is metered at the reservoir and is approximately 253 liters (67 gal) per capita per day. For planning purposes, the city estimates that per capita use will rise to about 303 liters (80 gal) per day as additional households are added to the system. This is based on the assumption

that water consumption will increase as piped water becomes the more predominant method of service.

At its present yield, Moonlight Springs can provide sufficient water to meet the demand through the year 2000, with the possible exception of decreases in flow due to breakup. If this begins to affect the service level, possible backup measures would have to be implemented to include conservation to restrict per capita use, or an alternative water source would have to be explored (e.g., other springs or wells or the nearby Snake River). The Water and Sewer Master Plan proposes a 4.5 million liter (1.2 million gal) storage reservoir to increase water storage.

Presently, two pumps provide 2,468 liters per minute at 293 kilograms per five centimeters squared (650 gal/per min at 100 psi), which is considered adequate for residential fire flow but not for structures such as hospitals, schools, or the central business district. One of the two pumps is considerably deficient in performance and should either be replaced or reconditioned.

The Nome sewage treatment and collection system presently serves about one-half of the households in the community. The remainder use honey-buckets and private septic systems as means of sewage disposal. Honey-bucket service for the city of Nome has recently been acquired by private industry. The main problem with the honey-bucket collection system is that it constitutes a health hazard. With several hundred gallons of water being delivered to households monthly and only a few gallons being retrieved, it appears that substantial amounts of waste water are being discharged on the premises. It is the goal of the city of Nome and the Indian Health Service that all residences and other facilities eventually be served by sewers within city limits.

The present Nome sewer system shares underground utility corridors with the water system. With the exception of one lift station, the sewage collection system is gravity flow to the sewage treatment plant, a primary treatment facility designed to handle treatment, digestion of sewage solids, and effluent disinfection. The plant is designed to accommodate average flows of 454 liters per minute or 654,048 liters per day (128 gal/min or 172,800 gal/day).

Portions of the primary system are presently overloaded. In addition, the plant design is inadequate to comply with federal law which mandates at least secondary treatment. Nome is presently required to meet secondary waste water treatment. To accommodate federal mandates, as well as to increase the capacity of the present system, CH2M Hill has been secured to identify and develop the plans for a secondary lagoon system.

The primary type of fuel used for electrical generation in bush Alaska is diesel. It is possible that several of the small generators will be retired and sold since the city has a surplus capacity of electricity.

In recent history, Nome's population, which has been relatively stable, yields an approximate per capita load of 1.95 kilowatts for all users. It is important to note that home heating is predominantly oil rather than electric and, therefore, keeps the per capita load requirement at a lower factor. Historical and present use rates have been stable at 14 megawatt hours per year.

General Telephone presently provides telephone service to almost all residential and commercial establishments in the city of Nome. All calls, except local ones, are relayed directly to satellite through electromechanical switching equipment. In terms of capacity, the present switching system is in good condition. An additional 200 connections can be made on the present system before a new system will have to be installed. This is an adequate cushion to plan for expansion.

Nome's solid waste collection is operated by a local private company that also provides honey-bucket collection service for the community. There are now 350 residential subscriptions and 52 commercial subscriptions for solid waste disposal. This waste is disposed of in a city-owned fill. The city uses a D-7 CAT and a 13-F CAT for maintenance of this 30-acre site.

e. Land and Housing: Land use patterns in Nome were basically established during the Gold Rush era at the beginning of the 1900's. At that time, land use patterns developed parallel to the shoreline of Norton Sound. The commercial district developed along Front Street. Residential areas grew north of the commercial district along the sand spit, west of the Snake River, and on Belmont Point. Warehousing also developed along east Front Street where supplies were easily landed from incoming ships. Nome has a tightly developed core area which reflects past development and platting efforts.

With a few minor exceptions, all residential development in the Nome area is located in the the boundaries of the Nome townsite. Residential development outside the townsite includes the FAA housing situated near the Nome airport, the State Highway's trailer court, the Beltz complex; the Alaska Gold Company's 50-man camp; and Icy View, a recent subdivision located north of town. This 33-acre, 103-lot subdivision was developed from the old patented mining claim and is the first development of its kind in the Nome area. Over half of the lots are sold, and owners have constructed approximately 20 homes. Distance from the city prohibits connecting Icy View to the city's water and sewage systems, and water and sewer are presently hauled to and from the subdivision. An upcoming drainage project on Sixth Avenue will accommodate residential expansion to the east of the present core area. The purpose of this project is to drain land on the northeast portion of town, much of which is marshy. Rains and spring thaws often cause flooding problems in Nome; and an extra benefit for Nome connected with this project is that it will open additional residential land along Sixth Avenue.

With the exception of the airport, the State Highway Department facility, the Beltz complex, Icy View, and the FAA housing, virtually the entire area for miles around Nome is tied up in mining claims, both patented and unpatented. Additional land is patented as homesites and Native allotments. Patented mining claims equal approximately 3,000 acres and Native allotments about 5,000 acres.

Under the terms of ANCSA, Sitnasuak Corporation selected nearly all of the unpatented land in the area. In chosing most of the available land along the rivers and the roads, Sitnasuak selected about 22 miles of coastline on both sides of Nome, including Cape Nome. For comparison, the Nome townsite is approximately 525 acres; and Sitnasuak's land entitlement under ANCSA is 161,280 acres.

(1) Development Constraints: Constraints to development in Nome are numerous and range from geologic hazards to land-ownership patterns. Among them are:

--Lack of Available Lots for Residential Construction: Local residents view this as one of the primary problems. Since Nome is surrounded by patented mining claims, community expansion is difficult and private lands are important for future development. Most of the undeveloped land within the Nome townsite, which is primarily located on the northeastern end of town, is owned either by the city or by private parties. Most of the lots the city has recenty sold are inaccessible because of the lack of roads, and they are not served by water and sewer facilities.

--Owners Will Not Sell Private Land: The main complaint about the privately owned land in Nome is that the owners will not sell. The Alaska Gold Company, owner of considerable land in Nome, is apparently not interested in selling it off in small parcels. Other private landowners seem to be speculating and waiting for higher prices in the future. Research indicates that land speculation in Nome is not new and has been going on for 5 or 6 years. This contributes to an acute shortage of available lots in Nome. The lack of available land and the high cost contribute to the crowded conditions in parts of the community.

--Right-of-Way Encroachments Due to Past Survey Problems: Much of the centrally developed core area is crowded and has a fractured lot pattern. Many interior lots do not have street access and property lines are often hard to determine.

(2) Housing: A 1968 field survey on Nome's housing conditions indicated over 70 percent of the housing was substandard. Nome's houses had either deteriorated beyond the point that repair was economically feasible, or they were characterized by grossly inadequate original construction. Lack of proper maintenence and sanitary facilities added to the blighted housing conditions. Generally, the condition of housing in Nome today is still poor. According to a 1981 field survey, only 22.5 percent of 951 housing units a in sound condition (ESL, 1981a). The harsh climate and lack of maintenence contribute to their deteriorating condition.

According to local residents, Nome presently has a critical housing shortage. Many existing housing units are uninhabitable because of their dilapidated condition. The land shortages, lack of available money, and high construction costs have hampered new construction. There are virtually no 3-bedroom houses for rent or sale in Nome. Bering View, the low-income rentals project constructed in 1972, had 60 applications on the waiting list for a house in the fall of 1979. Teachers arriving for the winter were 15 units short in September of 1979. Trailers are more common than in the past.

f. Health: Though funding and responsibility for health care are found in a number of agencies and programs, the Norton Sound Health Corporation (NSHC) is the primary provider of health-care services in Nome out of the Norton Sound Regional Hospital. In April 1977, the NSHC purchased the Maynard McDugal Memorial Hospital. A newly constructed Norton Sound Regional Hospital (an attached building to the old structure) opened in April 1978.

NSHC has about 125 full-time employees and 59 others classified as alternate, relief, or temporary. Of this total, the corporation employs four physicians who provide services at the hospital and travel to the villages in the region. There is one primary care physician for every 1,650 residents in the region.

In addition to NSHC, the State of Alaska employs three public health nurses, one registered nurse, and one community health aide to provide health care services. The U.S. Public Health Service, through the Indian Health Service, employs two dentists to serve the Native people. There are also two dentists who see private patients and who also work under Indian Health Service contracts.

Inpatient facilities at the Norton Sound Regional Hospital include 11 acute care beds, 2 pediatric beds, 2 intensive care beds, and 4 bassinettes. One wing is used as a long-term-care facility and six additional beds are licensed to accommodate that purpose. Occupancy ranges from 30 percent for newborn beds to 39 percent for other inpatients and 79 percent for long-term care. Except for long-term-care beds, these figures suggest a relative surplus within the region. However, because of the small population and number of total beds, the month-to-month variation in occupancy can be quite severe; and it is difficult to predict both average and peak requirements.

C. Biological Resources

1. Vulnerable Coastal Habitats - Yukon River Delta:

The vast Yukon-Kuskokwim River Delta complex extends into the Bering Sea south of Norton Sound. The Yukon River portion extends along a 200-kilometer section of the coastline from Stebbins (near Stuart Island) west and south to Cape Romanzof (Figs. III.C.1.-1 and III.C.1.-2).

a. The Delta's Importance as a Critical Habitat:

The Yukon River Delta is an important habitat for wildlife from all over the North American continent. The delta is used by enormous numbers of shore birds and waterfowl that migrate along the Pacific flyway, as described in Section III.C.3. on birds. The delta's extensive wetlands are the main habitat for 100 percent of the North American populations of the emperor goose, cackling Canada goose, and spectacled eider. Further, the delta has the largest concentration of nesting geese in North America. From May through September, approximately 24-million waterfowl and shorebirds are in the Delta.

The Yukon River Delta is also a critical habitat for probably the largest run of king salmon in North America (Trasky, 1980). Major spawning runs of salmon move through the Delta on their way into the fourth largest river in North America. As described in Section III.C.2. on fish, between 74,000 and 300,000 king and chum salmon are taken from the Yukon River each year by commercial and subsistence fishermen.

Lastly, the fish and wildlife resources in the delta are critical to the area's residents for basic subsistence. There are approximately 12,000 people in villages and scattered summer fishing camps throughout the region (Sec. III.B.1.). Fish, especially salmon, are the most important resource utilized, but geese, ducks, and certain marine mammals (seals, beluga whales, and the occasional walrus) are very important in some localities. Other fish, including herring, smelt, whitefish, saffron tomcod, and arctic (blue) cod are

Figure III. C. 1. – 1

YUKON RIVER DELTA PHOTOGRAPHED IN LATE WINTER (May 7, 1974).

White border of land fast ice extends offshore for about 30 - 40km.
Ice breakup is shown in dark areas along the shoreline.

Source: (LANDSAT Photograph No. E1653 - 21414 - 7,
provided by Stringer, OCSEAP R.U. No. 267.)

YUKON RIVER DELTA PHOTOGRAPHED IN SUMMER (July 22, 1975).
(Delta area from Stuart Island to South Mouth of Yukon River.)

Dark gray segment in upper left - hand corner : Intertidal or clear water zone in which birds feed. Medium gray band around edge of delta : Occasionally flooded wetlands. With regular tides, oceanic influence (Saline water) penetrates upstream in the distributaries to the separation of the North and Middle Forks.

Source: (LANDSAT Photograph No. E2181 - 21360 - 7, provided by Stringer, OCSEAP R.U. No. 267.)

taken on a fairly large scale, as well as crab, squid, and mussels (Ellanna, 1980). There is heavy subsistence and commercial utilization of the Yukon River stocks also in the interior of Alaska, as well as the Yukon Territory and British Columbia in Canada. For Native Alaskans in the Yukon Delta region, the amount of fish and wildlife resources harvested for subsistence is worth more than twice their yearly "cash" income (Wolfe, 1979).

The magnitude of the living resources of the Yukon Delta region has been catalogued in a number of recent publications, particularly the birds in the Outer Continental Shelf Environmental Assessment Program (OCSEAP) Bering Sea Synthesis (Gill and Handel, in press; King and Dau, in press), and the fish and wildlife in the miscellaneous reports of the Alaska Department of Fish and Game (ADF&G). Other good descriptive material is available in a series of publications supported by Shell Oil Company (Gusey, 1979), Alaska Geographic (Anonymous, 1979), and through the U.S. Fish and Wildlife Service, concerning the Delta's Clarence Rhode National Wildlife Range, a roadless area larger than any of the 10 smallest states. The present descriptive section is based primarily on the proceedings of an "Interdisciplinary Workshop on the Impacts of Potential OCS Development in the Yukon Delta Region," edited by Menzel and Wright (1981).

b. Physical Factors Influencing Assessment of Oil and Gas Leasing on the Delta: Several physical factors that influence the subsequent assessment of possible oil and gas leasing impacts on the delta are briefly summarized below. (These may be described more fully in Section III.A., Physical Considerations.)

(1) Storm Surges: The Yukon River Delta is also particularly vulnerable to storm surges (Jones et al., 1980). During the November 1974 storm, Section III.A.2.f., the water level rose about 3.5 meters over the northern part of the Delta (Sallenger et al., 1978). Also, solitary waves, generated by storms in the North Pacific Ocean, appear to cause flooding of the Delta, Section III.A.2.f.

(2) Delta Geomorphology: The modern subaerial and submarine delta is characterized by extremely gentle slopes, typically 1:1000 or less, on the sub-ice platform surrounding the Delta and scarcely greater on the Delta plain (Dupre' and Thompson, 1979). This is why moderate rises in sea level may cause such extensive inundation during storm surges or breakup floods. The extensive shallows offshore would facilitate vertical mixing of water with sediments (Larsen et al., in press).

(3) Sea Ice: The Delta is bordered during the winter by a zone of shorefast and bottomfast ice which may extend 30 to 40 kilometers offshore over a very gently sloping, prograding shoreline with depths of 1 to 3 meters (McNutt et al., in press; Thor and Nelson, in press). This ice does not necessarily form a continuous border because severe barotropic changes during winter storms can cause water level changes that distort or break up parts of the shore fast ice (Ray and Dupre', in press; Stringer, in press; Thor and Nelson, in press). Also, sub-ice channels remain open toward the shore, particularly in the area just south of the major distributaries which serve as pathways beneath the ice (Dupre' and Thompson, 1979).

(4) Estuarine Flow: As with all low gradient rivers flowing into the sea, there is a deep inflow of marine water extending upstream beneath the surface freshwater. This mechanism transports water and sediments considerable distances upstream. In the Yukon River, saline water generally penetrates upstream for about 50 kilometers to Hamilton (W. Kamkoff, personal communication).

(5) Tidal Excursion: Tidal circulation increases lateral spread and possibly vertical mixing in the water column due to current-induced turbulence. Tides in Norton Sound are primarily diurnal with currents of 20 to 30 centimeters per second. Diurnal excursions within the Sound tend to be narrow elipses extending in the east-west direction over distances of 10 to 15 kilometers. In the shallow water close to the Yukon River Delta, the currents and resultant excursions are unknown with no current observations at all close inshore. Tidal effects in the distributary channels of the river, including the extent of the subsurface salt wedge or tidal prism, are also unknown.

(6) Local Wind-Induced Flow: The most important and persistent local winds in the open water season near the Yukon Delta are the strong diurnal sea breeze effects produced by summer heating of the land surface. There are reports of daily onshore sea breezes as great as 30 kilometers per hour around Norton Sound (Muench, 1980). The influence of sea breezes may extend 10 kilometers offshore, but there are no observations near the Yukon River Delta.

It should be emphasized that the last two physical factors, tidal excursion and local wind-induced flow, may have a big influence on the likelihood that oilspills passing near the Delta will become rapidly entrained into the Delta, as explained further in Section IV.B.2.a.

2. Fish Resources: The first scientific, biological studies in the Bering Sea area, including Norton Sound, were carried out and reported by Ronsefell (1930). Since that time, fisheries studies have been carried out by others such as Alverson and Wilimsky (1966), Zagoshin (1967), and Alt (1971, 1972, and 1977). These and other population studies dealt primarily with commercial species such as herring, salmon, and crab.

Recent studies of the fish populations of the Norton Sound area are contained in study reports sponsored by the Alaska OCS Office and in Alaska Department of Fish and Game (ADF&G) annual reports. For further details on fish populations, see Wolotira (1977), Barton (1978), and the 1980 OCSEAP Synthesis Report on Norton Sound.

Available data concerning Norton Basin fishery resources deals mainly with the five species of Pacific salmon indigenous to the lease area. Of these, chum and pink salmon are most numerous and of greatest economic and subsistence value. Chinook salmon are the next most important species. Salmon studies have focused primarily on run timing, magnitude, age, size, and sex relationships, as well as spawning distributions of adult returns. This information is contained in ADF&G annual reports.

A recent OCSEAP survey summarized existing information on nearshore and coastal pelagic (open ocean) finfish, demersal or bottom dwelling fish, and shellfish. Although the nearshore coastal study was primarily concerned with spawning distributions of Pacific herring, other species commonly taken in gill nets and

beach seines included sheefish, several species of whitefish, arctic char, lake trout, grayling, burbot, suckers, sculpins, blackfish, stickleback, lampreys, several species of cod, flatfish, crabs, shrimp, and mollusks. A 6-week survey (September-October) was undertaken in 1976 to define the distributions and centers of abundance for several demersal fish and shellfish species. (See Figures III.C.2.-1 through III.C.2.-4.) Some of the more abundant demersal fish in the area include saffron cod, starry flounder, shorthorn sculpin, yellowfin sole, Alaska plaice, arctic cod, pollock, eelpouts, snailfish, herring, toothed smelt, pricklebacks, and sea poachers. Abundant benthic invertebrates include starfish and other echinoderms, snails, tanner crabs, red and blue king crabs, shrimp, and clams.

The results of the demersal fish survey indicate that for the September-October period, the highest relative abundance indices for nearly all fish and invertebrates (with the exception of the arctic cod) occurred south of the Bering Strait in Norton Sound at depths greater than 20 meters. Starfish and other invertebrates of little or no commercial importance comprised 74 percent of the total estimated biomass for the survey area. Cods and flatfishes were the most dominant fish families encountered (70% of the total estimated fish biomass). The fish sampled were generally small and, therefore, not of commercial interest. Estimates of biomass from other areas in the eastern Bering Sea are as much as 60 times greater than those obtained from this demersal survey. (Refer to Fig. III.C.2.-5.) However, clam beds and snail populations appear to be quite productive and may be of future commercial importance. See Wolotira (1977) for more detailed information.

While minor when compared with the fisheries of many other areas of the Bering Sea, the fisheries resources of the Norton Basin, nonetheless, are of major economic importance as well as critical for subsistence use by the local inhabitants. The fisheries are a significant link in the food chain for the dominant marine birds and mammals. Further, these fishes are unique in that they occupy the transition zone between subarctic and arctic marine communities.

Because of expressed concern, the major commercially exploited fish populations are discussed separately. This material is from the 1980 ADF&G reports to the Fish Board.

a. Salmon: Salmon use the Yukon River as a migratory corridor to distant spawning areas, many of which are located in the Yukon Territory, Canada (Graphic No. 3).

Four species of Pacific salmon are indigenous to the Yukon River, with chum salmon the most abundant. Chinook salmon are ranked second, followed in order by coho and pinks.

Although commercial salmon fishing in the area dates back to 1918, major utilization of all species has only existed since 1961. Nearly all of the area's commercial fishermen are resident Eskimos and Indians, as are most of the processing plant workers.

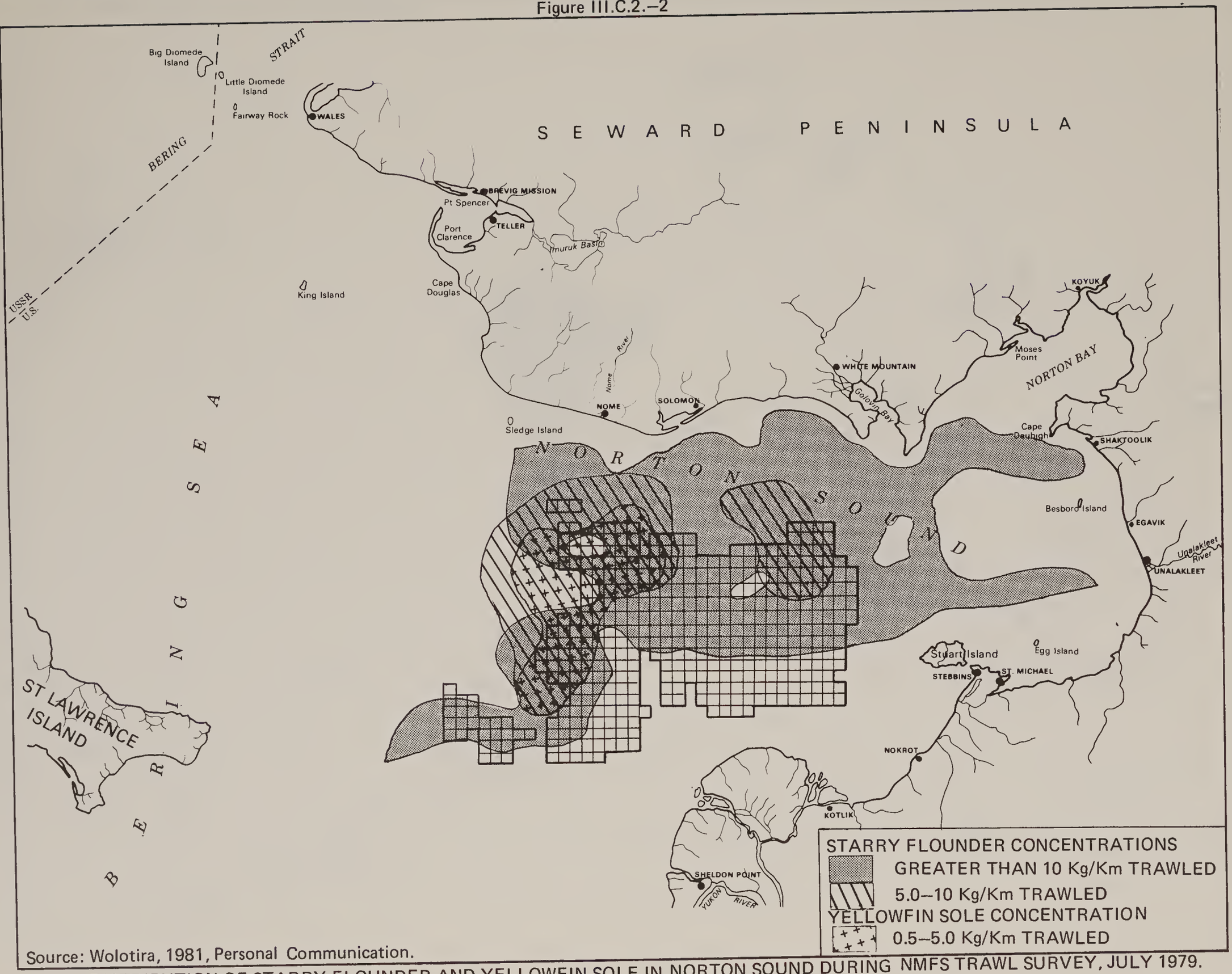
In terms of total Alaska salmon harvest, the Yukon River area is a minor producer, averaging approximately 800,000 fish annually, which represents less than 1 percent of the total statewide harvest. However, economically the

Figure III.C.2.–1

Source: Wolotira, 1981, Personal communication.

DISTRIBUTION OF SAFFRON COD AND ARCTIC COD IN NORTON SOUND DURING NMFS TRAWL SURVEY, JULY 1979

Figure III.C.2.–2



Source: Wolotira, 1981, Personal Communication.

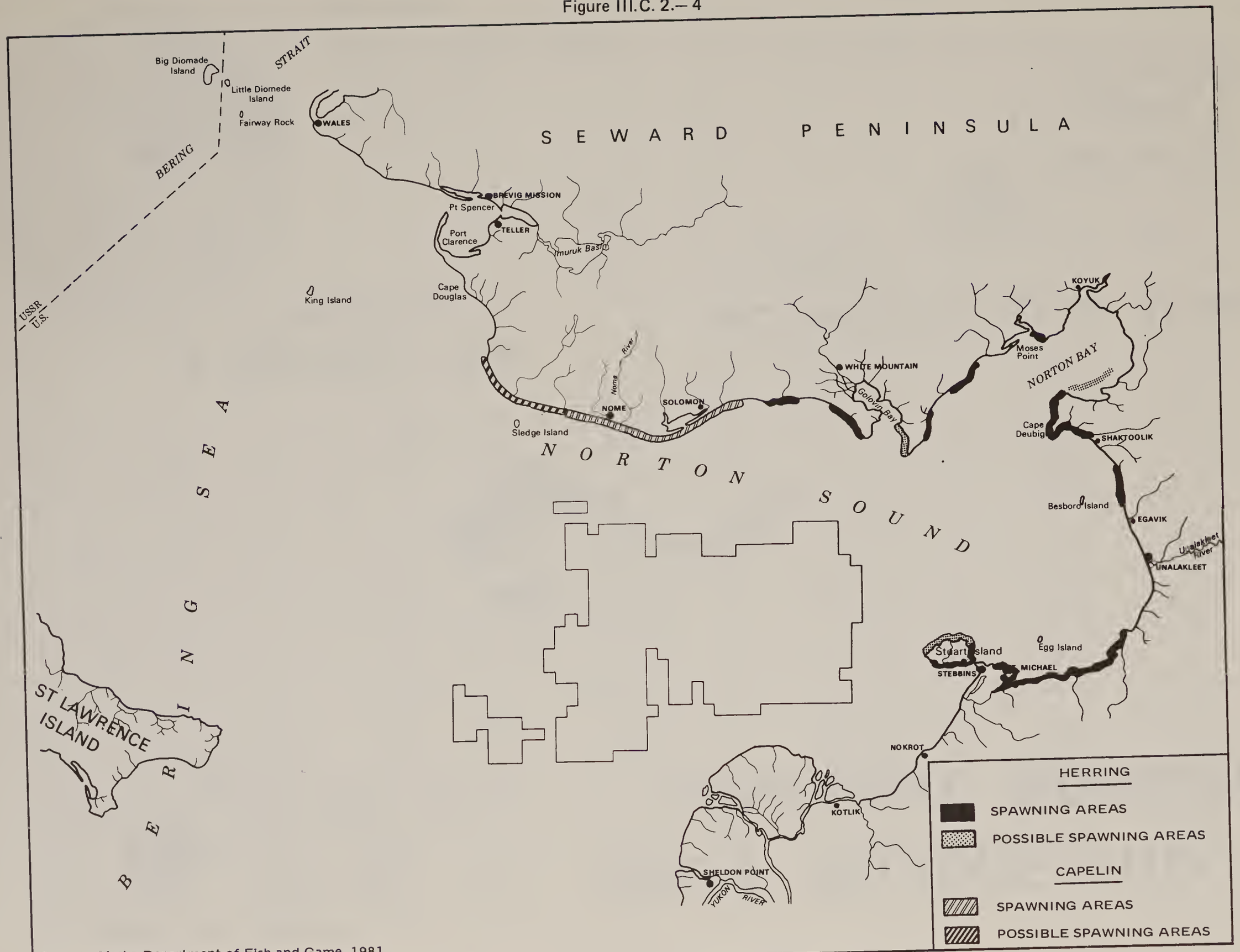
DISTRIBUTION OF STARRY FLOUNDER AND YELLOWFIN SOLE IN NORTON SOUND DURING NMFS TRAWL SURVEY, JULY 1979.

Figure III.C.2.–3

Source: Wolotira, 1981, Personal communications

CONCENTRATION OF RED KING CRAB (GREATER THAN 10 ORGANISMS/Km TRAWLED) IN NORTON SOUND DURING NMFS TRAWL SURVEY, JULY 1979

Figure III.C. 2.– 4



Source: Alaska Department of Fish and Game, 1981 .

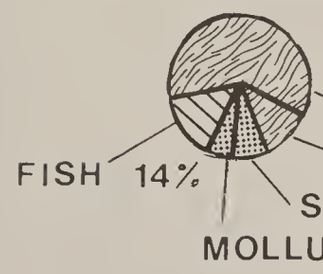
NEAR SHORE DISTRIBUTION OF SPAWNING HERRING AND CAPELIN IN NORTON SOUND

Figure III.C.2.-5

SHELF REGIONS AND DEMERSAL BIOMASS

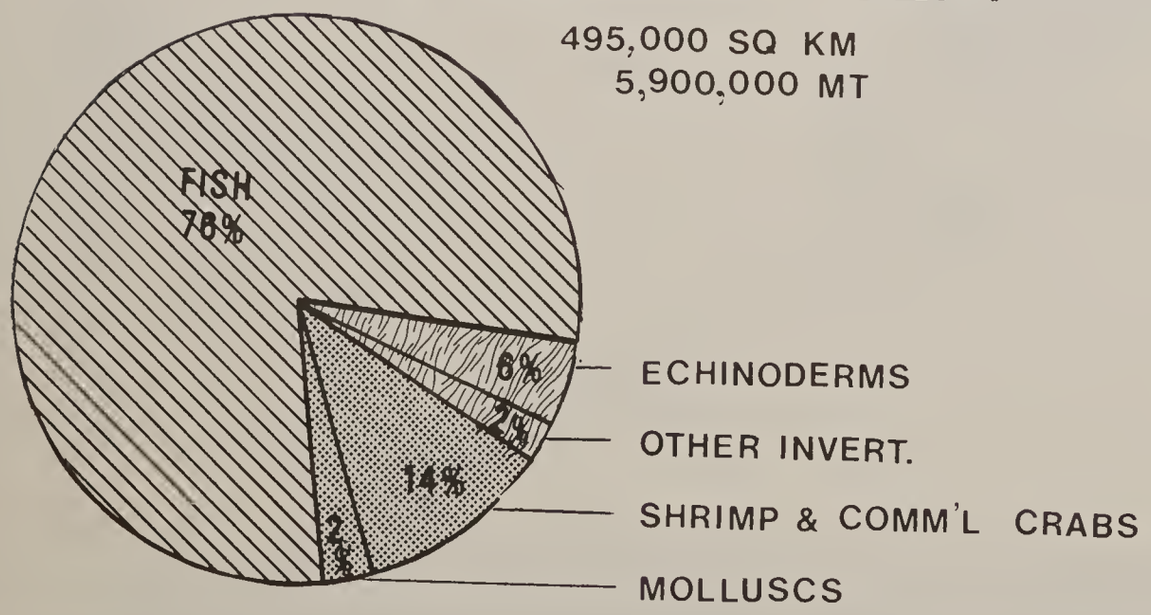
NORTON SOUND

76,000 SQ KM
210,000 MT



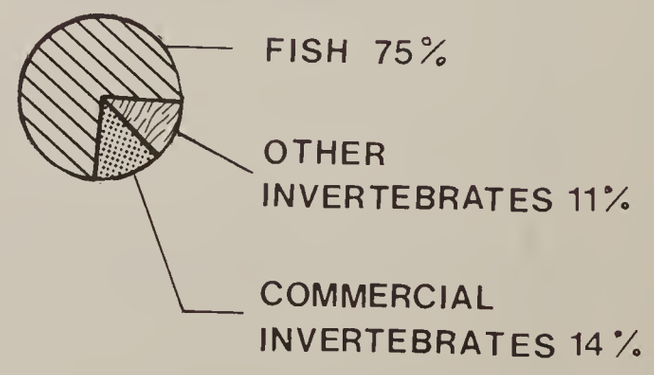
E. BERING SEA

495,000 SQ KM
5,900,000 MT



NORTHEAST GULF OF ALASKA

39,000 SQ KM
300,000 MT



Source: NMFS Data.

area's commercial fisheries are extremely important to the local economy and provide a much needed cash income. In recent years, increased catches and prices have resulted in higher annual values. The 1978 salmon fisheries were worth nearly 5 million dollars to the fishermen, which was the highest income ever experienced.

Chinook salmon are present in nearly all of the major tributaries throughout this area, extending to upper tributaries in the Yukon Territory, Canada. Adult chinook runs generally first appear off the Yukon River mouth in late May and extend into mid-July.

Normally, the adult coho salmon run first enters the Yukon River in late July. This run is characteristically about 1 week behind the fall run of chums.

There are two distinct major groups of adult chum salmon entering the Yukon River: summer and fall runs. Summer chums are characterized by an earlier timing (early June, mid-July), more rapid maturation in freshwater, smaller size (6-7 lbs), and larger populations. Fall chums are distinguished by later timing (mid-July, early September); a more uniform, robust body shape; larger size (7-8 lbs); and smaller population.

Pink salmon are present in nominal numbers and occur only in the lower Yukon River drainages. Out-migrating salmon are present in the proposed sale area from early May until July or August.

The principal salmon systems in the Norton Sound area, exclusive of the Yukon River, include the Unalakleet, Niukluk, Fish, Kachauik, Kwiniuk, Tubutulik, Shaktoolik, Koyuk, and Boston Rivers. The important salmon systems in Port Clarence are the Pilgrim River-Salmon Lake complex, the Kizitrin River, and the Agiapuk River.

All five species of North American Pacific salmon are indigenous to Norton Sound, not including the Yukon River. Chum and pink salmon are the most abundant, followed in descending order by coho, chinook, and sockeye salmon.

Although commercial salmon fishing in the Norton Sound area (exclusive of the Yukon River) started in 1961, this fishery has been characterized by sporadic fishing efforts as a result of a lack of processors and buyers or adequate tendering service. Recent emergence of cooperatives and improved tendering facilities has helped to stabilize the fishery.

The only documented commercial salmon fishery in the Port Clarence area was in 1966, although a few salmon are traditionally sold or bartered each year in Teller and Nome. A unique feature of this area is the Pilgrim River-Salmon Lake sockeye salmon run which is one of the northernmost occurrences of this species on the continent. The run is currently at low population levels. The Salmon Lake sockeye run has varied considerably in magnitude since 1963, with the 1969 run probably being the smallest. The chinook salmon run starts in mid-June and continues until mid-July when effort shifts toward chum, pink, and coho salmon. Chum salmon are in the bays and available to the fishery from June 20-25 until July 20-25. The pink salmon run, which is considerably shorter, enters the bays around June 25 to July 1 and arrives on the spawning grounds by July 15-20. The coho salmon run is later and is found in the fishery from August 1 until about August 20.

The Norton Sound and Port Clarence areas are among the northernmost distribution range for chinook, sockeye, coho, and pink salmon. Salmon stocks do not exhibit any apparent cycles as do stocks in more southern areas.

Chum and pink salmon are the most abundant species, and both are found spawning in many of the same streams. The remaining spawning systems in the Norton Sound area include the Kachauik, Niukluk, Fish, Tubutulik, Kwiniuk, and Unalakleet Rivers and Boston Creek. Chum salmon escapements exhibit annual fluctuations. Norton Sound pink salmon do not exhibit significant even-odd year fluctuations as do pink salmon in more southerly latitudes. They do, however, exhibit large annual fluctuations, apparently in response to climatic conditions.

Chinook salmon escapement information for the remainder of the Norton Sound area is limited. There is a possibility that Yukon River stocks may contribute substantially to the Norton Sound fishery during some years. Known chinook salmon spawning systems in Norton Sound include the North, Unalakleet, Shaktoolik, Ungalik, Inglutalik, Kwiniuk, and Tubutulik Rivers.

Little is known about the numbers and distribution of spawning coho salmon in the remainder of the Norton Sound area, but runs appear to be small and late. Coho salmon have been observed spawning under the ice as late as January.

b. Herring: Distribution information for Pacific herring is inferred from commercial and subsistence catch data. Herring move inshore from mid-June to late June. Most spawning occurs in Norton Sound east of 164° W. longitude. Herring start moving offshore during the late summer (August-September), and overwintering schools appear north of the Pribilofs in October.

Pacific herring spawn in the subtidal regions of Norton Sound using marine vegetation such as Fucus kelp and Zoestra eelgrass to lay eggs. Spawning occurs from late June or early July in eastern portions of Norton Sound. High spawning densities are common at Bluff, from Cape Darby to Moses Point, Norton Bay, Cape Denbigh-Arctic Hills, and the area to the east of 164° W., east of the St. Michael and Stuart Islands (Barton, 1978). The eggs are adhesive and hatch in about 3 weeks. Herring larvae are pelagic and the larval period lasts 1 to 2 months.

c. Crab: Information about crab populations in Norton Sound can be inferred from the commercial fishing areas and appears to be the northern portion of the Sound, particularly the region between Cape Rodney to Rocky Point and extending south to 63°. The region approximately 25 kilometers south of Cape Nome is also a region where many epifaunal species have highest biomass values, e.g., four species of stars, urchins, red king crab, Hyas crab, two hermit crabs, Argis shrimp, and two species of gastropods. Therefore, it is safe to assume that this region, which yields king crab in commercial quantities and large concentrations of other invertebrates, is a richly productive region of Norton Sound.

Little is known of the seasonal movements of invertebrates other than king crab. Since we see an annual nearshore spring migration of the reproducing populations of king crab in Kodiak and the southeastern Bering Sea, we can assume that this same migration phenomenon is occurring in Norton Sound.

While we are unable to accurately determine why this region is important to so many benthic species, we can glean some insight by looking at their food dependencies from other regions. Many of these species utilize deposit feeding infauna. King crab are predatory opportunists which presumably take deposit feeders, i.e., Yoldia sp., Pectinaria, Cistenides, and Diamphiodin. Sea stars, i.e., Leptastuirs, Evasterias, and Lethasterias, also utilize many deposit feeders as well as some suspension feeding infaunal species which reside in quasi-turbulent areas, i.e., Serripes, Clinocarbium, and Echinarachnins.

The shallow subtidal region (0-20 meters) is presumably extensively used by king crab for spawning, female molting, breeding, feeding, and rearing of young.

These phenomena are strictly seasonal, occurring from May to July. Rearing of young is assumed to occur throughout the year in this shallow region. Occasional observations of grasping king crab pairs have been made in shallow waters by Natives (further verifying the importance of this region). Presumably the entire coastal region from the Yukon Delta along the coast, counterclockwise to Cape Rodney, can be considered as probable king crab habitat.

During the ice-covered months, king crabs are harvested on a subsistence basis in areas local to villages. Therefore, adult king crab are thought to inhabit the inshore as well as the offshore regions of the Sound in winter months.

d. Other Species: Demersal fishes (species dwelling near the ocean bottom) are utilized by several groups at different times of the year. The demersal fish community of Norton Sound contains several families. The dominant ones are cods and flatfish. The dominant demersal species include saffron cod, starry flounder, yellowfin sole, and Pacific sand lance.

During winter months, saffron cod is used by man as a subsistence species. Subsistence harvests occur through the ice along the coast of Norton Sound in the vicinity of all villages. Saffron cod is used predominantly by marine mammals for food from spring through fall. Arctic cod are a primary food source for marine mammals during winter months. Sand lance are a major feed for birds, seals, and salmon during spring and summer. Starry flounder is harvested by man for subsistence primarily during spring and summer months.

During the summer, the distribution of most demersal fish species can be characterized by highest densities in outer Norton Sound between 163°-167° W. longitude, and from near the Yukon River Delta north to Port Clarence. Inner Norton Sound (the area east of 163°) is of lesser importance to demersal fish distribution (and abundance) than waters west of 167° W., which are apparently of low importance.

Inshore-offshore distribution changes occur for many species. Gadids generally follow an offshore to inshore movement in the fall, returning to areas offshore in the spring. The reverse situation occurs for many Pleuronectids, e.g., yellowfin sole move inshore to feed in spring.

Nothing is known about the winter distribution of demersal fish. Indirect evidence suggests there are major changes in the availability of some species, most notably arctic cod.

Flatfish occurring in Norton Sound, which have centers of abundance to the south (i.e, yellowfin sole, Alaska plaice, and starry flounder), are thought to be migrants from a peripheral portion of the southern stocks.

Very little distribution information is available for smelt. This species is circumpolar and is found in the Great Lakes region. Small numbers of toothed smelt were encountered in Norton Sound during the 1976 demersal survey. They were more common in nearshore coastal waters. Local residents report major smelt runs in the fall.

Detailed data on capelin distribution in Norton Sound does not exist. Adults are found nearshore in waters of relatively high salinity at ice breakup when spawning occurs. The abundance of this species is highly variable from year to year.
All species of pelagic fishes are found in the nearshore coastal waters of Norton Sound during ice-free months.

Little is specifically known about demersal fish reproduction in Norton Sound. Most information is inferred from literature sources from other regions (and from segments of existing Norton Sound information).

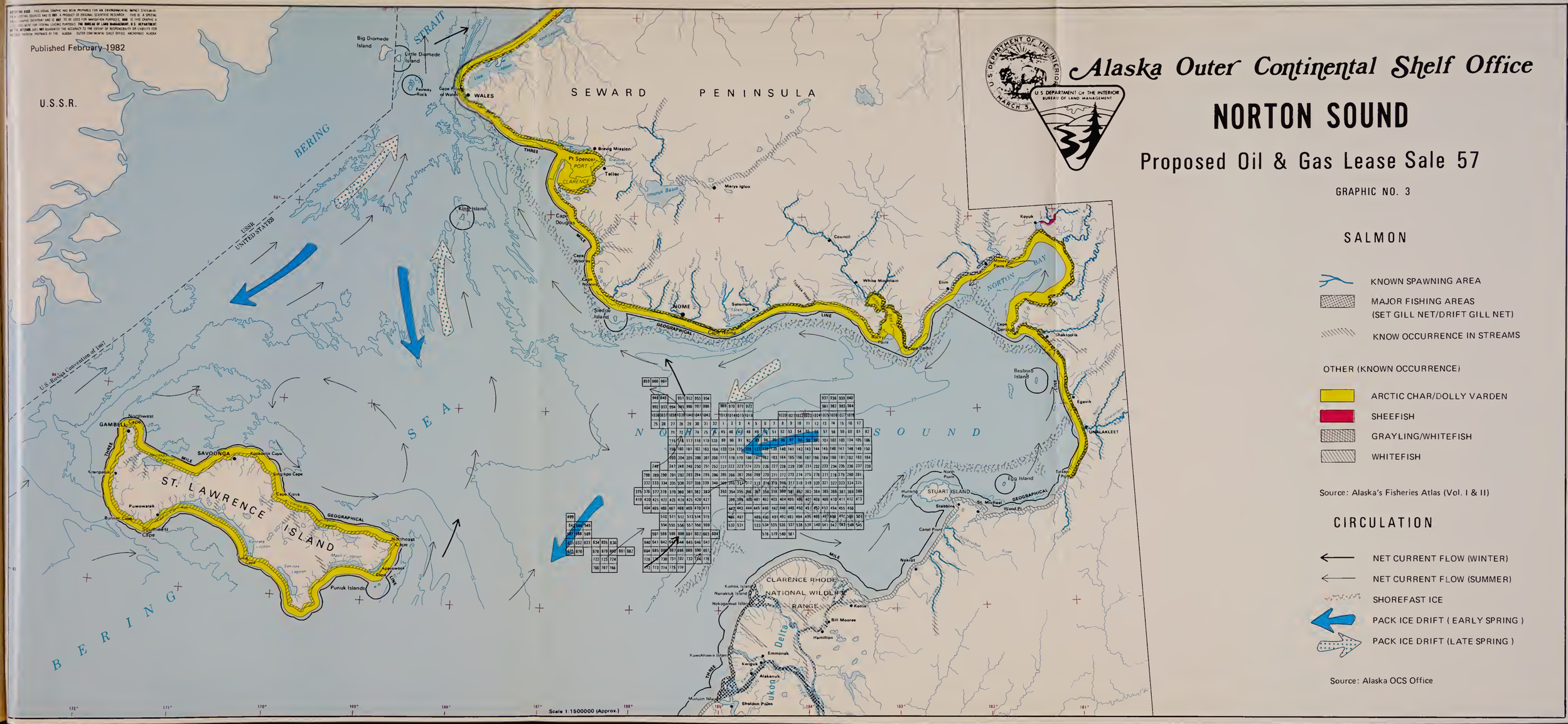
Saffron cod are fall-winter spawners (ripe individuals have been seen by principal investigators during October and January). Soviet information suggests that this species spawns in shallow, nearshore waters with a sandy substrate. Eggs are demersal and saffron cod larvae are pelagic.

Most of the existing information on arctic cod reproduction is from Soviet literature. A little can also be found in OCS studies from the Beaufort Sea region. Investigators have found gravid arctic cod in the Beaufort Sea in December and spawned out individuals in late February. Specific spawning regions in Norton Sound are not known. The 1976 baseline demersal survey catches indicated that young arctic cod were present mostly in waters west of 167° W. longitude, suggesting this area may be a potential spawning location. Development of eggs and larvae is very slow (eggs may be in surface waters up to 3 months before hatching and the larval stage lasts another 3 to 4 months).

Little is known about Pacific sand lance. Spawning in Norton Sound probably occurs in early spring, as recently hatched larvae have been found during June and July (Barton, 1978). Spawning most likely occurs in the nearshore zone since adults are encountered there during spring. Eggs are demersal. Sand lance are especially abundant near Port Clarence and Grantley Harbor, Bluff, and Golovin.

Yellowfin sole reproduction in Norton Sound is thought to be similar to that in the eastern Bering Sea where spawning occurs in late spring. Eggs of this species are pelagic.

Toothed (rainbow) smelt reproduction occurs in freshwater streams and very low salinity estuarine areas. There may be two separate spawning runs into Norton Sound, one during September-October, and the other during May or June (in the Golovin Bay area). Smelt eggs adhere to rocks or vegetation. Fall spawning is also known to occur near the Port Clarence/Grantley Harbor.



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MARCH 3, 1879

Alaska Outer Continental Shelf Office

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GRAPHIC NO. 3

SALMON

- KNOWN SPAWNING AREA
- MAJOR FISHING AREAS (SET GILL NET/DRIFT GILL NET)
- KNOW OCCURRENCE IN STREAMS

OTHER (KNOWN OCCURRENCE)

- ARCTIC CHAR/DOLLY VARDEN
- SHEEFISH
- GRAYLING/WHITEFISH
- WHITEFISH

Source: Alaska's Fisheries Atlas (Vol. I & II)

CIRCULATION

- NET CURRENT FLOW (WINTER)
- NET CURRENT FLOW (SUMMER)
- SHOREFAST ICE
- PACK ICE DRIFT (EARLY SPRING)
- PACK ICE DRIFT (LATE SPRING)

Source: Alaska OCS Office

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GRAPHIC NO. 4A

BIRDS

IMPORTANT SEABIRD HABITAT

SEABIRD COLONIES

- 100,000-1,000,000 BIRDS
- 10,000-100,000 BIRDS
- 10,000 BIRDS
- MAJOR SEABIRD CONCENTRATION AND FORAGING AREA
- OTHER IMPORTANT SEABIRD FORAGING

Sources: Alaska Department of Fish and Game, 1981, Habitat Protection Section; Drury, W.H., 1978 and 1980, Ecological Studies in the North Bering Sea: Birds of Coastal Habitats on the South Shore of Seward Peninsula, Alaska, NOAA-OCSEAP RU 237; Sowls, A.L., S.A. Hatch, and C.J. Lensink, 1978, Catalog of Alaskan Seabird Colonies, Fish and Wildlife Service, U.S. Department of the Interior.

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GRAPHIC NO. 4B

WATERFOWL AND SHOREBIRD AREAS

MAJOR WATERFOWL AND SHOREBIRD NESTING, FEEDING, MOLTING AND STAGING HABITATS

ST. LAWRENCE ISLAND WATERFOWL STAGING, MOLTING AND NESTING HABITAT

WATERFOWL AND SHOREBIRD GENERAL OFFSHORE MIGRATION ROUTES

SOURCE: Alaska Department of Fish and Game, 1981, Habitat Protection Section; Drury, W.H., 1978 and 1980, Ecological Studies in the North Bering Sea: Birds of Coastal Habitats on the South Shore of Seward Peninsula, Alaska, NOAA—OCSEAP RU 237

Capelin spawn from late spring or early summer in the intertidal zone of Norton Sound. Their eggs remain buried intertidally for 2 weeks or more before hatching. Nothing else is known about their reproduction.

Information on the reproduction of starry flounder in Norton Sound is not known. During the 1976 baseline demersal survey, no fish less than 5 years old were encountered. Five- and six-year-old starry flounder were found only in inner Norton Sound (inside a line from Cape Darby to Stuart Island).

It is interesting to note that for most demersal species taken during the 1976 survey, a very large proportion of the young fishes were present in mid and inner Norton Sound (east of 165° W. longitude).

3. Birds:

a. Introduction: The proposed Norton Sound lease area is adjacent to the major northern Bering Seabird colonies and offshore bird concentration areas. At least 5 million breeding seabirds, or 23 percent of Alaska's nesting population, occur in this area, including 3 of Alaska's 10 largest seabird colony complexes (Trap, 1979). St. Lawrence Island to the west of the lease area has one of the largest nesting populations (1.8 million) in Alaska, Little Diomede Island to the north has 1.3 million nesting birds, and St. Matthew Island to the south has 1.4 million nesting birds (Sowls et al., 1978). The lease area is immediately adjacent to one of the most important and productive waterfowl and shorebird habitats in North America centering on the Yukon River Delta.

b. Seabird Abundance and Distribution: The most abundant seabird species in the northern Bering Sea are least auklet, Aethia pusilla; crested auklet, Aethia cristatella; common murre, Uria aalge; thick-billed murre, Uria lomvia; parakeet auklet, Cyclorrhynchus psittacula; and black-legged kittiwake, Rissa tridactyla. The extremely abundant least auklet (2.25 million, 79% of the eastern Bering Sea population, Trap, 1979), and the crested auklet (800,000, 62% eastern Bering Sea population, Trap, 1979) are concentrated on a few breeding colonies primarily on St. Lawrence and Little Diomede Islands. The parakeet auklet is widely distributed with small colonies located along the coast of Norton Sound and larger colonies present on the offshore islands. The common and thick-billed murres (combined population over 1.5 million in the northern Bering Sea) are widely distributed with breeding populations on both the offshore islands and along the coast of Norton Sound.

Thick-billed murres more generally concentrate on offshore islands and shelf break areas, while the common murres are more coastal. Very large colonies (tens of thousands) of both murre species occur in the Bering Strait area on Little Diomede, King, and St. Lawrence Islands. Large populations of common murre are located within Norton Sound on the Bluff Cliffs west of Cape Nome and on Sledge Island. Black-legged kittiwakes are also widely distributed with substantial mainland, coastal, and offshore island populations. The largest populations of this species in the area occur on St. Lawrence and Little Diomede Islands with sizable populations on King Island, Bluff Cliffs, Sledge Island, and Cape Denbigh (see Graphic No. 4A).

Other common seabird species in the Norton Sound lease area are horned puffin, Fratercula corniculata; tufted puffin, Lunda cirrhata; pelagic cormorant, Phalacrocorax pelagicus; and pigeon guillemot, Cepphus columba.

Norton Sound has a relatively small seabird population with the largest concentration in the Bluff Cliffs area east of Cape Nome. However, the offshore area west of a line from the east end of St. Lawrence Island to Cape Spencer (see Graphic No. 4A), extending west through the Chirikof Basin, is a high density foraging area. Densities of over 200 birds per square kilometer ($500/mi^2$) have been recorded in this area. Flocks of murres and auklets on the water in tens of thousands are common. Seabird concentrations are the largest over the deep water on the west end of St. Lawrence Island, west of King Island, and in the Bering Strait.

c. Trophic Relationship: The dramatic differences in bird densities between the Norton Sound area and the Chirikof Basin-Bering Strait area primarily reflect the greater abundance and availability of zooplankton in the latter area. This is demonstrated by the great abundance of plankton-feeding species, such as thick-billed murres, and the least, crested, and parakeet auklets, which nest on St. Lawrence, King, and Little Diomede Islands.

During the nesting season, least auklets primarily eat copepods; crested auklets mainly take euphausiids; and parakeet auklets prey on a variety of zooplankton, pelagic invertebrates, and occasional small fish.

Thick-billed murres take more fish (sand lance, arctic cod, and prickleback) during the nesting season, but zooplankton still compose a significant part of their diet.

Other abundant species such as common murre, black-legged kittiwake, horned puffin, and pelagic cormorant prey primarily on fish during the nesting season. Sand lance, cod, and prickleback are important food sources for these species. The reproductive success of black-legged kittiwakes is greatly dependent on the availability of sand lance during the chick-rearing period (Drury, 1978). Trophic data indicate that years of reproductive failure may be related to the shortage of this food source in the diet of this species.

Seabirds such as murres and kittiwakes are adapted to natural changes in food availability by having a long adult life and low reproductive rate. These adaptations allow populations to maintain their numbers during years of low food availability which results in partial or complete reproductive failure. During years of food scarcity, perhaps only the most experienced birds attempt to nest at the colony. Less-experienced breeders may not even make an appearance at the colonies. During years of abundant prey, nearly all adult birds may attempt to nest. Large fluctuations in nesting black-legged kittiwake populations recorded in the northern Bering Sea support this hypothesis.

d. Seasonal Occurrence: The seasonal occurrence of seabirds in the northern Bering Sea is determined essentially by the presence of pack ice. As pack ice forms and advances to the south, most seabird species either migrate to wintering areas or retreat along the ice front.

Only two species have major adaptations to the ice environment, the ivory gull, Pagophila eburnea, and the black guillemot, Cepphus grylle; while a third, the

Ross' gull, Rhodostethia rosea (rare occurrence in Alaska), is associated with the ice environment during the nonbreeding season (Divoky, 1980).

By January, the proposed sale area and most of the northern Bering Sea is covered by pack ice and nearly all seabirds have left the area. Along the ice front, murres are the most abundant species and gulls are common. Bird densities as high as 10,000 per square kilometer occur along the ice front (Divoky, 1980).

The maximum extension of the pack ice generally lasts through April. In late April and May, seabirds move into the proposed sale area and concentrate in very large numbers in open water areas or ice leads within the pack ice. Open water near colony sites are particularly important to seabirds in May and June prior to the complete recession of the pack ice. During the summer (July and August) the greatest densities (over 500 birds/km^2) occur in the area immediately west of Norton Sound. Fall (September-November) is a transition period with seabirds leaving the colonies and migrating south at a slow pace, while arctic post-nesting seabirds from Cape Thompson and Cape Lisburne colonies swim or fly through the sale area preceding the return of the pack ice.

e. Waterfowl and Shorebird Distribution and Abundance - Yukon-Kuskokwim Delta: The greatest nesting concentrations of waterfowl and shorebirds along the coast of the proposed sale area are found on the Yukon-Kuskokwim River Delta with other important nesting, feeding, and staging areas occurring along the coast of the Seward Peninsula and St. Lawrence Island (see Graphic No. 4B).

Over 24 million individuals representing at least 60 species of swans, geese, ducks, and shorebirds use the Yukon River Delta. About 11.6 million waterfowl, including approximately 30 percent of North America's goose population, nest in the Bering Sea region (King and Dau, 1980). The greatest nesting concentration of geese in North America occurs on the Clarence Rhode Wildlife Range. The highest total densities of all waterfowl species (400 nests/km^2) occur along the vegetated intertidal zone (King and Dau, 1980). The most abundant nesting waterfowl species include whistling swan, Olor columbianus; cackling Canada goose, Branta canadensis minima; Taverner's Canada goose, Branta canadensis taverneri; white-fronted goose, Anser albifrons; emperor goose, Philacte canagica; black brant, Branta bernicla; pintail duck, Anus acuta; spectacled eider, Lampronetta fischeri; arctic and red-throated loons, Gavia arctica and Gavia stellata; and oldsquaw, Clangula hyemalis. Other waterfowl species, such as the lesser snow goose, Chen caerulescens; king eider, Somateria spectabilis; Steller's eider, Polysticta stelleri; and surf scoter, Melanitta perspicillata utilize the Yukon River Delta in large concentrations for molting and feeding during fall migration stopovers.

Emergent and wetland vegetation such as various sedges are the primary food types for most waterfowl. The Delta waterfowl populations are particularly important for subsistence hunting by Natives living on the Delta and in the Bristol Bay region.

There are several common shorebird species on the Delta: semipalmated plover, Charadrius semiplamatus; black turnstone, Arenaria melanocephala; western sandpiper, Ereunetes mauri; short- and long-billed dowitcher, Limnodramus griseus and Linnodramus scolopaceus; red and northern phalarope, Phalaropus

fulicarius and Phalaropus lobatus; semipalmated sandpiper, Ereunetes pusillus; and dunlin, Caldris alpina. Of these, most of western Alaska's breeding populations of black turnstone and dunlin are restricted to this habitat (King and Dau, 1980). The highest nesting concentrations of shorebirds also occur along the low-lying coastal habitat. The intertidal mud flats are particularly important foraging areas for shorebirds during fall staging and migration. Invertebrates such as dipteran larvae and various mollusks of brackish and freshwater flats and ponds are the principal food sources for shorebirds. The sandhill crane, Grus canadensis, is also a common nester on the delta.

f. Waterfowl and Shorebird Distribution and Abundance - Seward Peninsula-Norton Sound: Most lagoons, deltas, river mouths, and coastal tundra along the coast of the Seward Peninsula are used by waterfowl and shorebirds for feeding, staging, molting, or nesting during some part of the year (see Graphic No. 4B). The most conspicuous or abundant species breeding along the south shore of the Seward Peninsula are pintail, Canada goose, green-winged teal, Anas crecca; greater scaup, Aythya marila; oldsquaw; black scoter, Melanitta nigra; northern phalarope; semipalmated sandpiper; lesser golden plover, Pluvialis dominica; whimbrel, Numenius phaeopus; common snipe, Gallinago gallinago; and western sandpiper (Drury, Ramsdell, and French, 1980; Shields and Peyton, 1977). Among the coastal habitats along the south shore of the Seward Peninsula, the greatest concentrations of waterfowl and shorebirds tend to occur in the Golovin Lagoon-Fish River flats area (over 17,000 total reported) and the Moses Point lagoon and delta area (Kwik River and the Kwiniuk River deltas with over 10,000 total reported). Other major nesting and concentration areas include the Safety-Taylor Lagoon River deltas area, Koyuk-Inglutalik River deltas area, Shaktoolik River flats, Stebbins flats, and Woolley Lagoon (see Graphic No. 4B).

St. Lawrence Island also is an important nesting and wintering area for waterfowl. Twenty-two species occur on the island, and at least 12 of the species nest there (Fay, 1961). Tundra habitats along the shores and islands in the lagoons and lakes provide nesting habitat for about 9,000 ducks, geese, and swans. The lagoons, lakes, and tundra provide nesting, foraging, and molting sites for an additional 25,000 nonbreeding waterfowl as well. St. Lawrence Island wetland habitats provide a staging area for an international population of lesser snow geese that breed on Wrangell Island in the U.S.S.R. The island supports perhaps the entire immature nonbreeding population of emperor geese from Alaska and Siberia during the summer. The open-water areas around St. Lawrence Island support an estimated 500,000 oldsquaw and 50,000 eiders during the winter (Fay, 1961). These populations are important for subsistence hunting during the winter months.

Unlike the Gulf of Alaska and the southern Bering Sea that have major seabird and waterfowl concentrations present thoughout the year, the proposed lease area has a distinct seasonal pattern of bird abundance during the open-water season. Populations are greatly reduced or completely absent when ice covers the area. This is particularly true on the Yukon River Delta and other waterfowl and shorebird habitats along the Seward Peninsula.

The Delta freezes over in October-November and is vacated by waterfowl and shorebirds until late April-early May. During the spring, the first migrants appear in open-water leads offshore in mid-April. The first major influx of nesting waterfowl usually occurs the first week in May. The peak nesting

period is from late May through June with molting generally occurring in July through mid-August. Southward migrants from the arctic begin to stop over on the Delta by July and continue through October.

Birds of prey present in the proposed sale area during the spring, summer, and fall include gyrfalcon, Falco rusticolus; marsh hawk, Circus cyaneus; merlin, Falco columbarius; snowy owl, Nyctea scandiaca; common raven, Corvus corax; and short-eared owl, Asia flammeus. The golden eagle, Aquila chrysaetos; peregrine falcon, Falco peregrinus; and rough-legged hawk, Butea lagopus are also present.

4. Marine Mammals: The reader is referred to Alaska OCS Technical Paper No. 5, Marine Mammals, Endangered Species, and Rare Plants Potentially Affected by Proposed Federal Lease Sales in the Northern Bering Sea and Norton Sound Vicinity, for a detailed description of the population status, habitat requirements, food habits, and reproductive characteristics of non-endangered marine mammals which occur in the northern Bering Sea and proposed sale area. The technical paper discusses those species for which it is likely that a significant population segment may occur within a primary zone of influence of the proposed sale, i.e., the northern and north central Bering Sea, north of 62° N. latitude and south of the Bering Strait.

All relevant species are carnivores and include the spotted seal, Phoca vitulina largha; ringed seal, Phoca hispida; bearded seal, Erignathus barbatus; ribbon seal, Phoca fasciata; walrus, Odobenus rosmarus; polar bear, Ursus maritimus; beluga whale, Delphinapterus leucas; killer whale, Orcinus orca; and minke whale, Balaenoptera acutorostrata. Other species which are uncommon in Norton Basin (i.e., the major geological basin of the northern Bering Sea including Norton Sound) but which are regularly observed in small numbers include Steller sea lion, harbor porpoise, Dall porpoise, and northern fur seal. Known sea lion summer haulout areas of minor importance have been depicted in Graphic No. 5A. Due to the relative numerical insignificance of the latter species in the northern Bering Sea, they have not been discussed in detail. The northern right whale dolphin and certain beaked whales also may occur in the Norton Basin area, but are rarely sighted.

All marine mammals in U.S. waters are protected under the Marine Mammal Protection Act (MMPA) of 1972. In the Act, it was declared to be the intent of the Congress that marine mammals "Be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management, and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem." The reader is referred to Burns (1970), Martin (1977), Coffey (1977), Haley (1978), and Slijper (1979) for additional accounts of the characteristics, habitat requirements, and natural history of these species.

The following is summarized information regarding the occurrence of major species specific to the proposed sale 57 area.

Spotted Seal: The Bering Chukchi population ranges from 280,200 to 330,000 spotted seals. Major population segments migrate through outer Norton Sound during spring (April-June) and fall (late November-early January). Spotted seals could be expected to occur throughout the Norton Sound area particularly in nearshore waters during summer. Important haulouts in the Sound vicinity

occur on St. Lawrence Island, Stuart Island, Besboro Island, Cape Denbigh, Cape Darby, Safety Lagoon, and Port Clarence and are occupied during summer months (Graphic No. 5A). Breeding occurs relatively far to the south of the proposed sale area at the seasonal ice front in late winter.

Ringed Seal: About 1.0 to 1.5 million ringed seals probably inhabit the Bering and Chukchi Seas. In winter, highest densities of ringed seals occur in the stable shorefast ice which represents prime breeding habitat. In winter, shorefast ice in the Norton Sound and St. Lawrence Island perimeters represent important breeding habitat for a portion of this population (Graphic No. 5B). Ringed seals also occur on drift ice. A migratory species, they are found primarily during fall, winter, and spring. This species may account for more than 50 percent of the total seals harvested for subsistence purposes. A total of about 1,000 to 1,500 are harvested in the Norton Sound vicinity.

Bearded Seal: From 300,000 to 450,000 bearded seals probably inhabit the Bering and Chukchi Seas. Norton Sound provides good habitat for bearded seals from late November through late June, and densities would be highest throughout the northern Bering Sea at that time. Migration for other marine mammals described here is closely associated with sea ice movements and its development/disintegration. Limited data suggest that this species has an area of abundance immediately north of St. Lawrence Island in late winter and early spring, with increased abundance within Norton Sound in late spring (Graphic No. 5B). Drift ice of Norton Sound constitutes the breeding habitat of this species. About 700 to 1,000 are harvested annually in the Norton Sound vicinity, representing a major portion of the seals harvested.

Ribbon Seal: Estimates of the Bering Sea population of this species range from 60,000 to 114,000. Similar to spotted seals, wintering and breeding ribbon seals are associated with the ice front of the central Bering Sea. Ribbon seal occurrence in the northern Bering Sea and Norton Sound vicinity would increase in late May or early June dependent on ice conditions. During summer they take up a pelagic existence in waters of the Bering Sea; their summer distribution is not well known. Relative significance of Norton Sound habitats to the species is unknown in terms of spring or summer utilization. During most years, only a small portion of the population migrates through the Bering Strait. Only a few are harvested in the vicinity of Norton Sound.

Walrus: About 80 percent of the world population (160,000-200,000) occur seasonally in the Bering Sea. Herds of migrant walrus appear on Big Diomede, King, St. Lawrence, and the Punuk Islands in fall (October-December) during movements into the area from the Chukchi Sea. Most data indicate that during the seasonal transition periods, walrus densities are greatest in outer Norton Sound west of 166° W. longitude (Graphic No. 5C). Intermittent use of Sledge Island and Besboro Island as walrus hauling areas has been reported. King Island has been utilized regularly as a summer hauling area by several thousand walrus (Graphic No. 5A). Calves are born during the northward migration in spring (April-June); outer Norton Sound could be considered a calving area of this species. It is estimated that 33 to 50 percent of the walrus population (as many as 100,000 walrus) will move northward in spring east of St. Lawrence Island and immediately adjacent to the proposed sale area. Much of this population segment would be comprised of nursing females with calves. Increased walrus utilization of areas immediately north of St. Lawrence Island has been reported in recent years. Populations are probably at or near the

carrying capacity of their typical winter habitat south of St. Lawrence Island. From 1,500 to 2,000 walrus are retrieved annually by local hunters in the Norton Sound area.

Polar Bear: Polar bears enter the Norton Sound region in the fall with advancing ice and usually penetrate the Bering Sea no further south than St. Lawrence Island. Occasionally polar bears summer on St. Lawrence Island. The approximate number of polar bears which occur in the Norton Sound vicinity is unknown and, most likely, highly variable from year to year. Harvest total is from 10 to 30 animals annually.

Beluga Whale: In excess of 5,000 beluga whales migrate annually through the northern Bering Sea. In spring (late March-May), belugas move through the Norton Sound area, most passing through the Bering Strait. Some, however, penetrate the Yukon River or occur throughout the summer in nearshore shallow water of the Sound's perimeter. Calving is reported to occur in Norton Bay near Moses Point. Belugas return to and pass through the northern Bering Sea in December; some may winter to the northwest of St. Lawrence Island.

Minke Whale, Killer Whale: Minke whales occur broadly over the north Pacific and into the Chukchi Sea during the summer months. They are considered of low abundance, although they are regularly sighted in the St. Lawrence Island vicinity. No reliable population estimate exists for killer whales of the northern Bering Sea, although they also are observed frequently in the vicinity of St. Lawrence Island from spring through fall.

5. Terrestrial Mammals: Although some land mammals important for subsistence (such as moose and reindeer) occur in coastal habitats, these species have little relevance to offshore oil and gas development in Norton Sound. Oilspills that reach the beaches, salt marshes, or other shoreline habitats could have some local effect on terrestrial mammals in the vicinity. However, the number of individual animals involved would very likely be insignificant to the population. Disturbance from shore-based facilities as proposed at Cape Nome and increased human populations due to OCS development may cause some displacement and perhaps increased hunting pressure. However, the direct effects of OCS development in itself on terrestrial mammals would probably be insignificant and, thus, are not discussed further.

6. Endangered Species: The reader is referred to Alaska OCS Technical Paper No. 5, Marine Mammals, Endangered Species, and Rare Plants Potentially Affected by Proposed Federal Lease Sales in the Northern Bering Sea and Norton Sound Vicinity, for a detailed description of the population status, habitat requirements, food habits, and reproductive characteristics of non-endangered marine mammals which occur in the northern Bering Sea and proposed sale area. Species discussed in the technical paper are those for which it is likely that a significant population segment may occur within a primary zone of influence of the proposed sale, i.e., the northern and north central Bering Sea, north of 62° N. latitude and south of the Bering Strait.

As defined in the Endangered Species Act of 1973, an endangered species is any species which is in danger of extinction throughout all or a significant portion of its range, whereas a threatened species is a species which is likely to become endangered within the foreseeable future. Species protected by the Act are those officially listed or proposed to be listed as threatened

or endangered in the Federal Register. Of this list (Federal Register Vol. 45, No. 99), there are five endangered cetaceans and one endangered avian species which may occur to varying extent in or near the proposed sale area. These include the gray whale, Eschrichtius robustus; bowhead whale, Balaena mysticetus; humpback whale, Megaptera novaeangliae; fin whale, Balaenoptera physalus; sei whale, Balaenoptera borealis; and peregrine falcon, Falco peregrinus anatum, F. p. tundrius. These six endangered species are those which, at least to a small extent, may be affected by the proposed lease sale or associated activities. At present, there are no threatened or endangered plants listed or proposed for listing which may occur in this region. A Revised Notice of Review of a list of endangered Alaskan plant species may be published soon. Several rare plant species occur on upland areas near the proposed sale.

Bowhead Whale: The bowhead whale population of the Bering Sea numbers from 1,700 to 2,800 with the best estimate of the population size at about 2,260. Confined to the Bering, Chukchi, and Beaufort Seas, the spring migration of this stock occurs primarily around the western end of St. Lawrence Island from late March to late May (Graphic No. 6A). Areas immediately north of St. Lawrence Island and north of the village of Savoonga are likely sites of occurrence of bowheads in the spring after they have rounded the western end of the island. In general, areas east of 166° W. longitude (e.g., within Norton Sound proper) are not utilized by the species, although unusual movements into the Sound have been known to occur. The southward, fall migration through the northern Bering Sea usually occurs in November through December; animals enter the area in a diffuse pattern and some may possibly move around the eastern end of St. Lawrence Island (Graphic No. 6A). Bowheads winter in the central western Bering Sea and are assumed to occupy drift ice habitat near the ice front. In the winter of 1979, bowhead utilization of drift ice habitats immediately south and west of St. Lawrence Island was reported.

Gray Whales: There are approximately 15,000 to 17,000 gray whales which migrate annually into and through the northern Bering Sea, representing almost the entire population. Arriving in the St. Lawrence Island vicinity in late May, most of the population feeds in the northern and western Bering Sea with great intensity during June and July. Major feeding areas are located north of St. Lawrence Island during these months; the whales heavily utilize benthic amphipods of the Chirikof Basin (roughly extending from St. Lawrence Island to the Bering Strait, Graphic No. 6A). Nearshore coastal areas immediately southeast and west of St. Lawrence Island are important feeding grounds as well. In late summer, substantial numbers of gray whales are known to move into the southern Chukchi Sea. Fall migration through the Bering Strait and west of the proposed sale area occurs primarily from September through October.

Humpback, Fin, and Sei Whales: Relatively small numbers of these species, probably representing only portions of their entire populations, are known to occur in the western Norton Basin area and western northern Bering Sea. Graphic No. 6B illustrates approximate locations for most probable occurrence of these species.

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Published February 1982

U.S.S.R.

SEWARD PENINSULA

WALES

Big Diomede Island

Little Diomede Island

Fairway Rock

Cape Prince of Wales

Bravig Mission

Port Spencer

Teller

Marys Igloo

King Island

Cape Douglas

Cape Woolley

Cape Rodney

Imuruk Basin

Council

Koyuk

Moses Point

White Mountain

Elim

NOME

Solomon

Solomon River

Topkok Head

Rocky Point

Cape Darby

Cape Nome

Sledge Island

Shaktoolik

Besboro Island

Egavik

UNALAKLEET

Golovin

Golovin Bay

Topkok

Cape Denbigh

Norton Bay

Stuart Island

North Head

Humboldt Point

Stebbins

St. Michael

Wood River

Clay Island

Canal Point

Nortak

GAMBELL

Northwest Cape

SAVOONGA

Kookoolik Cape

Sinuksipo Cape

Cape Kialik

Kingaluk

Puwowalak

Bunnell Cape

Southwest Cape

ST. LAWRENCE ISLAND

Northeast Cape

Apavowuck Cape

Punuk Islands

CLARENCE RHODE NATIONAL WILDLIFE RANGE

Nukleet Island

Nokapmiut Island

Kotlik

Bill Moores

Hamilton

Kwemkwenuk Island

Emmonak

Kwiguk

Alakanuk

Yukon Delta

Mountain Island

Shaldon Points

BERING SEA

ARCTIC OCEAN

U.S.-Russia Convention of 1867

USSR

UNITED STATES

THREE MILE

GEOGRAPHICAL LINE

Scale 1:1500000 (Approx.)

Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 5A

MARINE MAMMALS

Migration and most probable occurrence during summer and fall.

- WALRUS, BELUGA WHALE, OCCASIONAL BEARDED SEAL, POSSIBLE RIBBON SEAL – SUMMER UTILIZATION OF OPEN WATER (July –Sept.)
- SPOTTED SEAL HAULING AREA
- WALRUS HAULING AREA, FREQUENT USE
- WALRUS HAULING AREA, OCCASIONAL USE
- MINOR SEA LION HAUL–OUT
- BELUGA SUMMER FEEDING MOVEMENTS
- BELUGA POSSIBLE CALVING AREA
- FALL MIGRATORY MOVEMENT (Oct.–Dec.) BEARDED SEAL, RINGED SEAL, SPOTTED SEAL, RIBBON SEAL, WALRUS , POLAR BEAR (Rarely south of St. Lawrence Island), BELUGA WHALE

SOURCE: Kelly (1980), Nelson (1980), Burns and Frost (1979), Burns (1980), Fay (1980 , Personel Communication)

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SEWARD PENINSULA

BERING STRAIT

Big Diomede Island

Little Diomede Island

Fairway Rock

Cape Prince of Wales

WALES

Bering Land Bridge Nat'l Preserve

Kotzebue Lagoon

Kotzebue Sound

Brevig Mission

Pt Spencer

PORT CLARENCE

Teller

Grantley Harbor

Imuruk Basin

Marys Igloo

King Island

Cape Douglas

Cape Woolley

Cape Nome

Sledge Island

NOME

Solomon

Council

Koyuk

Moses Point

Elim

White Mountain

NORTON BAY

Golovin Bay

Topkok Head

Cape Denbigh

Rocky Point

Cape Darby

Shaktoolik

Besboro Island

Egavik

UNALAKLEET

Tolstoi Pt

Egg Island

North Point

Hungry Point

STUART ISLAND

Stabbins

St. Michael

Wood Pt

Canal Point

Nokfot

Kotlik

Bill Moores

Hamilton

Emmonak

Kwigluk

Alakanuk

Hooper Bay

Kawekhawek Island

Mukuk Island

Sheldon Point

Yukon Delta

Yukon River

CLARENCE RHODE NATIONAL WILDLIFE RANGE

Kothlik Island

Nunekluk Island

Nokogamnut Island

Northwest Cape

GAMBELL

Kukulik

SAVOONGA

Kookoolik Cape

Siglikpak Cape

Cape Ivluk

Puwowalek

Sunuk Cape

Southwest Cape

ST. LAWRENCE ISLAND

Northeast Cape

Sevuokuk Lagoon

Kuk Lagoon

Kuk Cape

Kookooligit Mts

Kookooligit Lagoon

Kookooligit Mts

Kookooligit Lagoon

Kookooligit Mts

Kookooligit Lagoon

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U.S.S.R.

SEWARD PENINSULA

BERING STRAIT

BERING SEA

CHUKCHI SEA

ST. LAWRENCE ISLAND

NORTON SOUND

NORTON BAY

U.S.-Russia Convention of 1867

INTERNATIONAL DATE LINE

GEOGRAPHICAL MILE

THREE MILE

Big Diomede Island

Little Diomede Island

Fairway Rock

Cape Prince of Wales

WALES

Brevig Mission

Pt Spencer

Teller

PORT CLARENCE

Grantley Harbor

Imuruk Basin

Marys Igloo

Kiwalik

Cape Douglas

Cape Woolley

Cape Rodney

Sledge Island

NOME

Cape Nome

Solomon

White Mountain

Elim

Council

Koyuk

Moses Point

Rocky Point

Cape Denbigh

Cape Darby

Shaktoolik

Besboro Island

Egavik

UNALAKLEET

Tolstoi Pt

Egg Island

North Point

Hunting Point

STUART ISLAND

St. Michael

Wood Pt

Stebbins

Canal Point

Nokotl

Northwest Cape

GAMBELL

SAVOONGA

Kookulik Cape

Sivuokuk Cape

Cape Ketchi

Kangulakit

Puwowalak

Bonney Spit

Southwest Cape

Northeast Cape

Apaiyuwool

Punuk Islands

Kookulik Lagoon

Mask Lagoon

Sevuokuk Lagoon

Kathlok Island

Nunakuk Island

Nokogamiut Island

CLARENCE RHODE NATIONAL WILDLIFE RANGE

Kotlik

Bill Moores

Hamilton

Kawokhawik Islands

Emmonak

Kwigluk

Alakanuk

Munivin Island

Shaldon Points

Yukon Delta

YUKON RIVER

KUSKOKWIM BAY

Scale 1:500000 (Approx.)

Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 5C

MARINE MAMMALS

Walrus area of abundance and most probable occurrence during winter and spring ①

WALRUS EARLY WINTER (Nov.–Dec.) AREA OF ABUNDANCE

WALRUS LATE WINTER (Jan–March) AREA OF ABUNDANCE

WALRUS SPRING (April–June) AREA OF ABUNDANCE ②

①Source: Krogman et. al. (1979), Kelly (1980)

②All Norton Sound area occupied by drifting ice–potential walrus habitat.

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Published February 1982

Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 6A

ENDANGERED SPECIES

Bowhead Whale, Gray Whale, Peregrine Falcon and Rare Plants – Most Probable Occurrence ①

- BOWHEAD SPRING MIGRATION, USUAL (April –May)
- BOWHEAD SPRING MIGRATION, INTERMITTENT (Late May)
- BOWHEAD FALL MIGRATION (Nov.–Dec.)
- BOWHEAD FALL MIGRATION, POSSIBLE
- BOWHEAD WINTERING (Dec. –March, Intermittent)
- GRAY WHALE SPRING MIGRATION (Late May –June)
- GRAY WHALE FALL MIGRATION (Oct. –Dec.)
- MAJOR GRAY WHALE FEEDING AREAS (June – Sept.)
- GRAY WHALE SUMMER MOVEMENTS
- PEREGRINE NESTING OBSERVED AND/OR MOST LIKELY (June–July)
- PEREGRINE FREQUENT SIGHTINGS (June-Aug.), NOT KNOWN TO OCCUR BUT POSSIBLE
- PEREGRINE HISTORICAL OCCURRENCE/POTENTIAL HABITAT

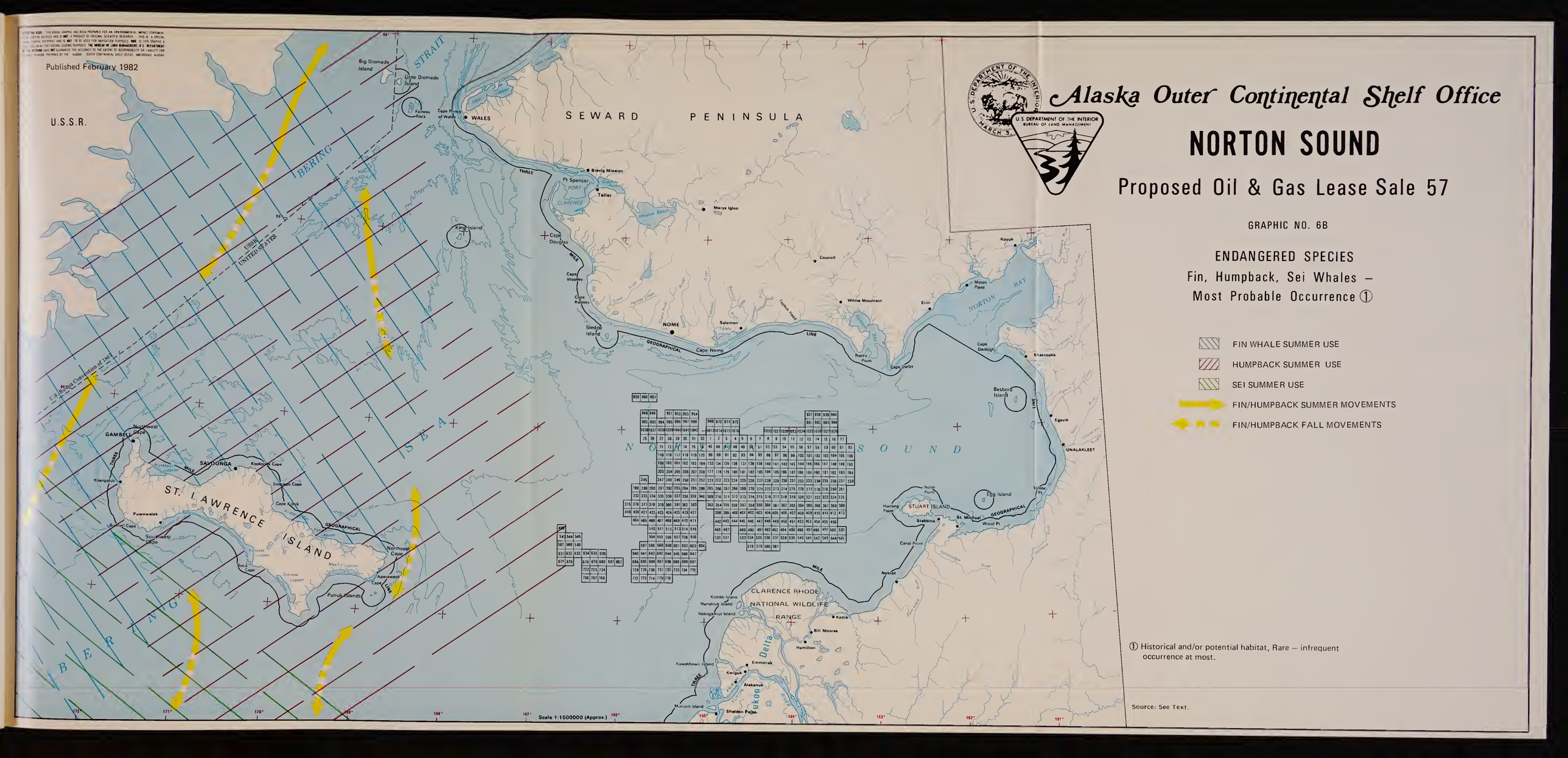
RARE PLANTS

- ARCTIC SAGE
- WALPOLE POPPY
- ANDERSON SEDGE

Sources: See text.

Approximate location of known occurrences; other sites of occurrence may exist. Much of the information portrayed here is based on sighting data. Geographical and seasonal variation in observer effort and variation among observers' abilities to identify cetaceans are sources of bias in such data. We have utilized available data at the time of the map preparation. It is our intent to illustrate here known recent occurrences and general patterns of cetacean distribution in the proposed sale area, rather than describe definitively the temporal changes in distribution or densities of endemic cetaceans.

Scale 1:1500000 (Approx.)



Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 6B

ENDANGERED SPECIES
Fin, Humpback, Sei Whales –
Most Probable Occurrence ①

- FIN WHALE SUMMER USE
- HUMPBACK SUMMER USE
- SEI SUMMER USE
- FIN/HUMPBACK SUMMER MOVEMENTS
- FIN/HUMPBACK FALL MOVEMENTS

① Historical and/or potential habitat, Rare – infrequent occurrence at most.

Source: See Text.

Peregrine Falcon: Peregrine falcons occur in the spring and summer in the proposed sale area. Graphic No. 6A illustrates known or suspected nesting sites. Sledge Island, Bluff, and locations near Cape Rodney have been determined as most likely active nesting sites. In general, nesting areas and sites for occurrence of this species are associated with major seabird colonies upon which peregrines depend as prey sources.

Rare Plants: Three rare plant taxa are known to occur in or adjacent to Norton Sound, including an arctic sage, Artemisia senjavinen; Anderson sedge, Carex jacobi-peteri; and the walpole poppy, Papaver walpolei (Graphic No. 6A). Upland areas near Cape Nome are potential habitats for the arctic sage and walpole poppy. The sedge occurs on St. Lawrence Island and near Tin City in the Bering Strait region.

D. Economic Considerations

1. State and Regional Economies: Because the employment and other general economic impacts of Bering-Norton OCS petroleum development on areas of Alaska other than the Nome Census Division are expected to be mild, they are not discussed in this text. However, for a description of the economy of Alaska and historical economic statistics, see OCS Technical Report No. 50, pages 13-46. Pages 46-57 of the same report provide information about the economy of the Anchorage region, which serves as the transportation and trade center for most of Alaska including the Nome area. (Note: All figures for economic impacts of OCS development which are presented in OCS Technical Report No. 50 are based on assumptions which have been revised. For economic impact information based on current assumptions, see Section IV.B.3. of this EIS. Also refer to "Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models," November 3, 1980, prepared for the Alaska OCS Office by the Institute of Social and Economic Research, University of Alaska.)

Although employment and other general economic impacts outside the Nome census division resulting from Bering-Norton OCS development are expected to be minor, possible oilspills in the Norton Sound could have significant adverse effects on the salmon fisheries of the lower Yukon and the upper Yukon and on other economically important wildlife resources. For that reason, it is necessary to describe briefly the economic importance of these resources.

In 1977, the lower Yukon set gill net salmon fishery was fished by 647 boats, most of which were small boats usually manned by only one, or sometimes two, fishermen. In 1977, the salmon catch in this fishery totaled 6.5 million pounds for which fishermen were paid $3.6 million. More recent figures for numbers of boats are unavailable. In both 1978 and 1979, the total catch was 4.4 million pounds. Total payments to fishermen were $2.6 million in 1978 and $3.0 million in 1979. The lower Yukon salmon harvest is processed on floating processors or shipped elsewhere for processing. The income from salmon harvesting in the Lower Yukon was earned almost entirely by local residents, for whom fishing represents the major source of dollar earnings. Residents of the area, who are mostly Eskimos, rely on subsistence hunting and fishing for most of their food (Wolfe, 1979). However, they require some cash income as a supplement to subsistence activities and also to purchase fuel, boats, guns, and ammunition required for subsistence activities.

The economic significance to local residents of the relatively small dollar income from commercial salmon harvesting is suggested by the very small per capita personal income of residents of the Wade Hampton census division, which includes the Yukon Delta. In 1978, per capita income in the Wade Hampton census division was estimated by the U.S. Bureau of Economic Analysis at only $2,938 or 37 percent of the average U.S. income per person. When the Wade Hampton figure for per capita personal income is adjusted for the extremely high living costs in the area, which are estimated at more than twice as high as average U.S. living costs, the per capita purchasing power of local residents in 1978 was only 16 percent of average U.S. per capita purchasing power. These figures do not include an estimate of the value of food from subsistence hunting and fishing. (See Table III.B.4.-1.)

In the upper Yukon fishery, salmon harvesting is accomplished by fish wheels as well as by set gill nets. The harvest is shipped elsewhere for processing. In both 1978 and 1979, the total catch was about 885,000 pounds. Payments to fishermen totaled $513,000 in 1978 and $597,000 in 1979. As in the lower Yukon, the money earned from salmon fishing in the upper Yukon fishery probably represents the major source of earned dollar income to the fishermen.

In both the upper and lower Yukon fisheries, the salmon resources are extremely important to the local economies both for commercial fishing and for subsistence purposes. Other species of fish are also important for subsistence use, as well as various species of birds and marine mammals. The value of all fish and other wildlife resources harvested for subsistence by Native residents of the Yukon Delta has been recently estimated at more than twice the cash income of the Native population of the region (Wolfe, 1979). Reliance on subsistence economic activities will be increased due to recent (1981) federal government expenditure cutbacks in welfare and food stamp programs. There were also cutbacks in the Comprehensive Employment and Training Act (CETA) program which provided direct employment for many area residents and prepared others for employment by providing job-related training.

2. Local Economy (Defined as the Economy of the Nome Census Division, With Emphasis on the City of Nome and the Immediate Area):

a. Introduction: As background for the discussion of economic and population impacts on the Nome area, this section includes an historical sketch of Nome as well as historical economic and population figures for the city of Nome and the immediate vicinity. It also presents historical figures for the Nome census division (in addition to the immediate Nome area the Nome census division includes 16 outlying communities on the Seward Peninsula and on St. Lawrence and Little Diomede Islands), and it provides a detailed description of the local economy.

b. Historical Sketch of Nome: In July 1898, gold was discovered on the southern side of the Seward Peninsula, directly across Norton Sound from the mouth of the Yukon River (see Fig. III.D.2.b.-1). The discovery was large enough to attract 3,000 persons to the area in the following year. Originally known as Anvil City, the community thus founded was renamed Nome (Grauman, 1977).

Historians credit the discovery of gold at Nome to three men who were forced ashore by a storm, after which they made a substantial find at Anvil Creek

Figure III.D.2.b.–1

Source: U.S. Bureau of the Census

(Grauman, 1977). However, Daniel Libby also located gold on the Seward Peninsula in 1898--he claimed he first discovered gold in that area in 1866 when he journeyed to the Seward Peninsula as part of a Western Union expedition to lay a telegraph cable to Siberia. Western Union engineers figured that laying a cable between Alaska and Siberia across 60 miles of shallow continental shelf, then extending the cable across Asia to Europe, would be easier than laying a cable to Europe across 2,000 miles of deep Atlantic Ocean. However, just as the expedition arrived in the Nome area, a successful trans-Atlantic cable was completed. Shortly thereafter, Libby presumably made his first gold discovery in the area. In any case, he did return in 1897 and found gold in 1898 (Naske and Slotnick, 1979).

The story of Daniel Libby highlights a unique geographic feature of the Nome area--a vast offshore continental shelf stretching all the way to Asia. Much of this shelf is less than 35 fathoms in depth (210 ft), which is approximately the increase in ocean depth estimated to have occurred due to the melting of glaciers following the end of the last ice age. Scientists believe that during the ice age Alaska was connected to Asia by a land bridge measuring nearly 1,000 miles from north to south and that the ancestors of Indians in South and North America migrated across the bridge from Asia many thousands of years ago. Ancestors of the Eskimos of North America are believed to have migrated across the bridge at a later time.

The former land bridge to Asia makes up a large share of Alaska's vast offshore continental shelf area, which totals a half million square miles. This is nearly as much as the land area of Alaska, which is 586,000 square miles.

This land bridge constitutes a potentially great economic resource to the Nome area in the form of oil, gas, and hard minerals deposits. The shallow offshore continental shelf is also economically important because of its huge resources of fish, crab, and marine mammals. Eskimos of the area, who constitute most of the population, continue to obtain a very large share of their food from subsistence hunting and fishing activities. They catch and hunt salmon, crab, walrus, seal, whales, and polar bear. The walrus ivory is also of commercial importance; and commercial fishing of salmon, herring, and king crab contribute to the local economy.

From about 3,000 persons in 1899, the population of Nome climbed to 12,488 in 1900 (Table III.D.2.b.-1). The city of Nome was incorporated in 1901; and by 1906 Nome was an established community with schools, churches, several newspapers, and a hospital. Nonetheless, throughout its early gold-boom period, Nome earned a well-documented reputation as an extremely dangerous, lawless community.

During the years 1898 through 1906, the placer deposits at Nome produced about one-third as much gold as was produced in the legendary Klondike during the same years. After 1906, production began to decline, but was revived in 1915 by a shift toward larger-scale operations. During World War I, shortages and high costs of labor, materials, and equipment virtually stopped gold production, which did not resume until 1923 (Grauman, 1977).

During the period from 1923 until World War II, gold operations followed an erratic pattern which included a reasonably prosperous period from 1929 to 1934. World War II again halted gold operations, after which the rising costs

Table III.D.2.b.-1
NOME POPULATION GROWTH 1900-1979

YEAR	AREA		POPULATION
1900[1]	Nome, Town		12,488
1910	Nome, Town		2,600
1920	Nome, Town		852
1930	Nome Townsite, Inc.		1,213
1940	City of Nome		1,559
1950	City of Nome		1,876
1960	City of Nome		2,316
1970	City of Nome		2,488
1975[2]	City of Nome (March)		2,380
	(King Island Subtotal - 215)		
1976[3]	City of Nome (February)		2,605
1978[4]	City of Nome (July)	2,892	
	Contiguous Areas	272	
	Total Nome Area		3,164
1979[5]	Winter - City	2,842	
	Contiguous Areas	222	
	Total		3,064
	Summer - City	2,932	
	Contiguous Areas	272	
	Total		3,204

1 1900-1970 U.S. Census.

2 Linda J. Ellanna and Maureen C. Roche, "Bering Strait Regional Census 1975," Kawerak, Inc., October, 1976.

3 Water and Sewer Master Plan, City of Nome, 1976.

4 City of Nome.

5 Estimate of Policy Analysts, Limited, presented in "OCS Technical Report No. 53 (p. 12)."

of production combined with the statutory fixed price for gold eventually ended all gold mining other than very small operations by prospectors. Large scale gold operations did not resume until 1975, following removal of the statutory price limit of $35 per ounce (Grauman, 1977).

After the end of the gold boom in 1917, the cash economy of the Nome area remained essentially stagnant until Alaska Statehood was achieved in 1959 (Grauman, 1977). Traditional hunting, whaling, fishing, and gathering (berries and bird eggs) activities of the Eskimo population remained the basis for the economy of the area.

An economic activity which is almost unique to the Nome census division is reindeer herding, which was introduced early in the century. Reindeer hides and meat are used for subsistence and also sold commercially. Recently, reindeer antlers have been exported to the Orient, where high prices are paid for the supposed aphrodisiac qualities of the antlers.

By 1920, the population of the city of Nome had dropped to only 852. The population then grew slowly, reaching 2,316 in 1960 (Table III.D.2.b.-1). In recent years, most of the population of Nome has been Eskimo, in contrast to the early gold boom period when Nome was predominantly caucasian.

c. Recent Economic Developments: The more significant aspects of the economy of the city of Nome and the other areas within the Nome census division during the years since statehood (1959) are summarized below.

Nome has long served as the transportation and trade center for the smaller communities within the region, and in recent years Nome has become an important center of government activity.

Natives (Eskimos) constitute about three-quarters of the total population of the Nome census division. Within the city of Nome, Eskimos make up about 60 percent of the population.

For the Eskimo population, both in the city of Nome and in the outlying communities within the Nome census division, traditional subsistence activities including hunting, whaling, fishing, and gathering (berries and bird eggs) continue to be extremely important economic activities.

By contrast, the non-Native population (chiefly caucasian) relies on wage and salary employment as the principal means of earning a livelihood.

Only after Alaska Statehood was achieved in 1959 did any significant number of Native people obtain wage and salary jobs. For this reason, many Native residents have been forced to rely to some extent upon welfare payments to purchase heating fuel and other necessary commodities which cannot be provided by subsistence activities. Some cash income is needed to purchase guns, boats, gasoline, and ammunition used for subsistence hunting, whaling, and fishing.

The decade of the 1960's saw a modest increase in the number of state and local government jobs, resulting from the achievement of Alaska Statehood. These new jobs were in the city of Nome, rather than in the outlying communities. The generally low level of educational attainment of Native residents prevented

most of them from meeting the qualifications for government jobs, which tended to be filled by non-Native in-migrants to the area.

The 1960's also saw a steady increase in the number of tourist visitors to the Nome area. Expenditures by tourists created some new jobs in air transportation, hotels and restaurants, drinking establishments, and gift shops. Practically all of these new jobs were in the city of Nome. Some of the jobs related to tourism were filled by Native (Eskimo) residents of Nome. In addition, tourists purchased ivory carvings, fur garments, and other artistic and useful items produced by Eskimo residents of the region. These Native arts and crafts products began to be exported from the region in sizable quantities.

During the 1970's, job opportunities in tourist-related activities continued to increase, as did jobs in state and local government. State and local government employment jumped from 495 jobs in 1977 (annual average) to 763 in 1979, a gain of 54 percent (see Table III.D.2.c.-1). An indirect cause of this sharp increase was a stream of income to the State of Alaska from the Prudhoe Bay oil field, which began with completion of the trans-Alaska oil pipeline in mid-1977.

During the decade of the seventies, a significant number of the new government jobs was filled by Natives, in part because of their increases in educational attainment. An important contributing factor was the federal Comprehensive Employment and Training Act (CETA), which funded government and non-government positions intended to provide job experience for persons with limited skills and experience. CETA programs also provided formal job training which enabled area residents to qualify for jobs in private industry or in government.

Many government-type services were contracted to private non-profit corporations during the 1970's. In the Nome census division, an expanded program of health services as well as new adult education and job training services were administered by private corporations. As a result, annual average wage and salary employment in services increased from 263 in 1974 to 555 in 1978. (See Table III.D.2.c.-1.) Many of these new jobs were filled by Native residents. As with government jobs, the increased success of Natives in obtaining jobs in services activities was due to increased educational attainment and to the federal CETA program. Many of the new jobs in government-type services were in the city of Nome, but a significant number were in the smaller communities within the Nome census division.

Passage of the Alaska Native Claims Settlement Act by the U.S. Congress in December 1971 had two economic effects on the Nome Census Division. Beginning in 1973, sizable amounts of money were distributed from the federal government to special Alaska Native corporations created to administer the money and land awarded to the Native people under terms of the land claims settlement. A very small part of these cash distributions was passed on from the corporations to individual Native persons. The amount of government funds received by an individual Native person under the Alaska Native Claims Settlement Act has totaled less than $500 in a typical case during the 10-year period since passage of the Act (Arnold, 1980). (The personal income statistics published by the U.S. Bureau of Economic Analysis wrongly include all of the cash distributions to the Native corporations as personal income, thereby seriously distorting personal income information for 1973 and the immediately following years.)

Table III.D.2.c.-1
ANNUAL AVERAGE EMPLOYMENT IN THE NOME CENSUS DIVISION
1963 AND 1973 - 1979

	1963	1973	1974	1975	1976	1977	1978	1979
TOTAL EMPLOYMENT[1]	1,407	1,568	1,595	1,879	2,133	2,013	2,341	2,393
SELF-EMPLOYED	87	104	110	120	128	135	140	144
WAGE & SALARY EMPLOYMENT - TOTAL (including military)	1,320	1,464	1,485	1,759	2,005	1,878	2,201	2,249
Mining	11	0	0	40	105	100	95	120
Contract Construction	53	63	49	87	192	117	40	41
Manufacturing	8	15	25	34	13	45	42	49
Transp/Commun/Utilities	99	179	189	204	175	125	130	145
Wholesale & Retail Trade	139	153	175	211	231	241	271	270
Finance/Insurance/Real Estate	5	41	70	132	182	138	114	100
Services	75	249	263	341	380	389	555	543
Local Government							552	592
State Government							168	171
State and Local Government		487	436	469	474	495		
All Governments	430							
Federal Government (Civilian)		209	197	187	201	178	191	177
Military Personnel (Active Duty)	500	58	56	54	52	50	43	41
Unclassified	0	10	25	0	0	0	0	0

1 Excluding subsistence activities, which are extremely important to the economy of the Nome Census Division.

SOURCES: Publications of the U.S. Bureau of Economic Analysis and the Alaska Department of Labor, supplemented by discussions with persons familiar with the Nome area.

Creation of the Native corporations also provided new jobs, many of which were filled by Native persons. Although most of these new jobs were in the city of Nome, some were in the smaller communities. Mainly due to creation of the Native corporations, wage and salary employment in the finance/insurance/real estate category increased from 41 jobs in 1973 (annual average) to 182 in 1976 within the Nome census division. However, jobs in this category subsequently declined to 100 in 1979 (see Table III.D.2.c.-1).

Two more economic developments have been of importance in the two decades since Alaska Statehood was achieved in 1959.

Gold mining on a large scale was resumed in 1975, due to removal of the statutory price of $35 per ounce. By 1976, gold mining provided an annual average of approximately 100 wage and salary jobs. Many of these new jobs are filled by non-residents with special skills who live in Nome only during the peak operating months of the gold mining activity.

The other important economic development has been a steady increase in the importance of commercial fishing within the Nome census division.

d. Commercial Fishing Economic Base: This section describes the existing commercial fishery of Norton Sound. Most of the information is taken from OCS Technical Report No. 51.

The relatively small Norton Sound fishery is based mainly on salmon and herring with minor amounts of king crab. Table III.D.2.d.-1 shows the number of commercial fishing permits issued, by species. Employment in seafood processing is reflected in the manufacturing employment figures in Table III.D.2.c.-1, almost all of which are fish processing jobs.

Table III.D.2.d.-2 shows harvesting activity for the Norton Sound set gill net salmon and herring fisheries. Similar statistics are not available for Norton Sound king crab activities, which are reported as part of the Bering Sea king crab fishery.

The boats in the set gill net salmon fishery are typically less than 7.3 meters (24 ft) in length and are operated by a single fisherman. It is principally a local fishery, and the fishermen and boats are from Norton Sound communities including Elim, Golovin, Moses Point, Nome, Shaktoolik, Koyuk, St. Michael, and Unalakleet. The harvesting activity is based in these communities, and the harvest is landed in these communities. Although Nome is the population center of the area, it is not the center of fish harvesting or processing activity.

The salmon season begins in June and ends August 31. July is typically the most productive month.

The 1980 commercial salmon harvest in Norton Sound of 444,500 fish was the second largest on record. A total of 159 fishing vessels participated in this salmon fishery in 1980, slightly below 1978 and 1979 levels. Commercial Fishery Entry Commission (CFEC) permits issued in 1980 totaled 194. Commercial fishermen earned approximately $583,000 for their salmon catch.

The Norton Sound herring fishery is a set gill net fishery which was dominated by local fishermen from 1969 through 1977. Subsequently, purse seiners from

Table III.D.2.d.-1

NUMBER OF COMMERCIAL FISHING PERMITS, NORTON SOUND AREA, 1978
(Nome Census Division Communities Only)[1]

Community	No. of Permit Holders	*NUMBER OF PERMITS*					
		Salmon Set Gill Net Norton Sound Area	"Other" Species Other Gear Statewide	King Crab Unspecified Gear Norton Sound Area	Herring Spawn on Kelp Unspecified Gear Statewide	Salmon Set Gill Net Lower Yukon River Area	Herring Set Gill Net Westward Area
Council	1	1					
Elim	47	45	16				
Golovin	17	17					
Nome	136	23		113		1	1
Shaktoolik	35	29	5	1	13		1
St. Michael	19		10		9	1	
Stebbins	8					8	
Unalakleet	92	58		13	15	16	10
White Mountain	3	3					

1. A few small fishing communities on the southwest coast of Norton Sound are beyond the boundaries of the Nome census division. Fishing permit figures for these communities are provided in Table III.B.4.-4.

Source: University of Alaska, Alaska Sea Grant Program (1980).

Table III.D.2.d.-2
Harvesting Activity
Norton Sound Set Gill Net
Salmon and Herring Fisheries
1969-1980

Year	Salmon		Herring	
	Weight (million pounds)	Value (million dollars)	Weight (metric tons)	Value (dollars)
1969	0.9	0.1	0	0
1970	0.9	0.1	0	0
1971	0.9	0.2	0	0
1972	0.9	0.1	0	0
1973	1.2	0.4	9.0	400.00
1974	1.7	0.4	37.0	5,698.00
1975	1.5	0.4	0	0
1976	1.0	0.3	0	0
1977	1.7	0.5	0	0
1978	2.5	0.7	17.0	9,724.00
1979	1.9	0.7	1,172.0	773,520.00
1980	—	0.6	2,215.0	—

Source: University of Alaska, Alaska Sea Grant Program (1980).

other areas entered the fishery, but purse seines were declared illegal in 1980 and 1981. In 1979, approximately 70 percent of the fishermen who made landings were residents of the Norton Sound area, and about 50 percent of the total harvest was taken by these local fishermen. The 1979 harvest, which constituted 10 percent of the entire western Alaska herring catch, is thought to be more indicative of the potential of this fishery than are previous harvests. In fact, the potential of this fishery is considered to be much higher than the 1979 catch of 1,172 metric tons.

The 1980 herring season resulted in a harvest of 2,215 metric tons. Ninety-nine percent of the herring was used for sac roe, with the remainder being processed for bait. There were approximately 294 herring fishermen who made at least one delivery in Norton Sound during 1980. Of these, 67 percent were residents of the Norton Sound area. The remaining 33 percent were gill net fishermen who accompanied processors or tenders who came into Norton Sound from herring fisheries located in the south. Local fishermen landed approximately 55 percent of the total harvest.

The level of harvesting activity has changed rapidly and is expected to continue to change rapidly because its two principal determinants, resource abundance and exvessel prices, are subject to rapid changes. Large fluctuations in resource abundance are characteristic of herring fisheries.

The factors which explain the rapid changes in exvessel prices include the rapid changes in resource abundance, a highly inelastic demand for herring roe, and the timing of the western Alaska fisheries relative to other herring fisheries. The last factor will continue to make western Alaska herring prices more volatile than those of other areas, because the western Alaska fisheries are the last to occur prior to the period of concentrated retail marketing and consumption. Therefore, if harvests elsewhere have been adequate, there is little interest in western Alaska herring and exvessel prices tend to be low; but if there have been poor harvests elsewhere, the western Alaska prices tend to be exceptionally high.

In addition to the roe herring fisheries of Norton Sound, there have been and are expected to continue to be relatively minor herring roe on kelp fisheries. The roe on kelp fisheries have been relatively stable since 1976. In 1980, 20 fishermen harvested 22 metric tons valued at $73,000 from the Norton Sound fishery.

The offshore king crab fishery occurs in the summer and is participated in by large non-local crab boats that are part of the Bering Sea fleet. A much smaller nearshore fishery occurs in the spring and is participated in by residents of the Nome area using snow machines and dog sleds to transport crab that is harvested through the ice. There were 133 permits issued for the spring ice king crab fishery in 1978. The harvest, which totaled 11.4 metric tons (25,193 lbs) and was valued at $22,670, was taken by 37 fishermen. The participants in this fishery are residents of the Nome area and the catch is landed and processed in Nome.

Although commercial harvests in the Norton Sound area are low in volume and value compared to other areas of Alaska, the economic returns from fish harvesting and processing have benefitted virtually every family in the smaller communities which circle Norton Sound (Policy Analysts, Limited, 1980). Even

in the city of Nome, a large number of families rely upon local fisheries resources for some cash income as well as for subsistence purposes.

e. Future of Commercial Fisheries Without OCS Activities:

Recent harvest levels indicate that over 1,100 metric tons (2.4 million lbs) of salmon and 2,200 metric tons (4.9 million lbs) of herring can be landed on a continuing yield basis.

The annual harvest weight for the Norton Sound commercial salmon fishery is projected to moderately increase by 1.4 percent per year from 707 metric tons (1.6 million lbs) in 1980 to 943 metric tons (2.1 million lbs) in the year 2000.

All projected harvests in the Norton Sound roe herring fisheries are at the 1980 level of 2200 metric tons. However, the herring fisheries are expected to be highly unstable, with very large year-to-year changes.

In addition to the roe herring fisheries, relatively minor herring roe on kelp fisheries are expected to continue. In 1980, 20 fishermen harvested 22 metric tons of herring roe on kelp valued at $73,000.

The Norton Sound king crab fisheries are expected to remain a relatively insignificant part of the Bering Sea fishery. The small local king crab fishery which occurs during the spring on the ice near Nome was insignificant in the years 1979-1981, and it is not expected to grow significantly.

f. Other Economic Issues:

Seasonality: In the Nome census division, peak employment for 1978 was 2,446 wage and salary jobs in June, compared to only 1,816 the preceding February, for a peak/low ratio of 1.35 (2,446/1,816). Strongly seasonal industries include gold mining, contruction, fishing and fish processing, and tourism. However, the recent increases in wage and salary employment in government and services have tended to make the local economy less seasonal than in earlier years. In addition, a small start has been made in attracting tourist visitors to Nome during the winter months as well as during the summer.

Personal Income Levels: Table III.D.2.f.-2 shows the recent pattern of per capita personal incomes in the Nome Census Division. It also demonstrates the impact of extremely high living costs in the area, which are approximately 225 percent of average U.S. living costs.

Employment/Population Ratios: Table III.D.2.f.-1 compares historical figures for estimated population in the Nome census division to annual average wage and salary employment. The job figures are on a place-of-work basis and therefore show some jobs not held by permanent residents. The employment figures also include many part-time jobs, which are not adjusted to a full-time basis. Nonetheless, the employment/population ratio is a useful economic indicator, especially in showing changes over time in the relative economic well being of the residents of an area.

Importance of Subsistence Economic Activities: Even within the city of Nome, a large share of the total population is heavily dependent upon subsistence hunting and fishing activities based on the wildlife resources of the area.

Table III.D.2.f.-1

NOME CENSUS DIVISION
COMPARISON OF NUMBER OF WAGE & SALARY JOBS TO TOTAL POPULATION ESTIMATES
1963 AND 1973 - 1979

	1963	1973	1974	1975	1976	1977	1978	1979
(1) Wage & Salary Employment (Including Military)	1320	1464	1485	1759	2005	1878	2201	2249
(2) Estimated Population	6567	6000	6200	6500	7100	7000	6700	6800
(3) Ratio: Number of Wage and Salary Jobs to Total Estimated Population	0.20	0.24	0.24	0.27	0.28	0.27	0.33	0.33

Source: Population estimates are those published by the U.S. Census Bureau for the years 1973 through 1978. The 1979 figure is a guess based on the estimate for 1978. The population estimate for 1963 was published by the Alaska Department of Labor. Wage and salary employment figures are those published by the Alaska Department of Labor supplemented and modified by information from the U.S. Bureau of Economic Analysis.

EXPLANATION OF SIGNIFICANCE OF TABLE III.D.2.f.-1

Table III.D.2.f.-1 shows, in Line 3, changes over time in the purchasing power of residents of the Nome area. The increase in price-level-adjusted per capita income from $4780 in 1970 to $7025 in 1978 indicates an increase of 47 percent in per capita purchasing power. This represents an average compound growth of 5.7 percent from 1971 to 1978.

Figures in Line 6 indicate changes in the comparative economic well being of residents of the Nome area, relative to other U.S. residents. In 1971, Nome residents possessed roughly 30 percent as much per capita purchasing power as other U.S. residents. By 1978, Nome area residents possessed about 38 percent as much purchasing power as other U.S. residents.

Information about two additional aspects of the per capita income figures presented above is necessary for a realistic interpretation. First, the dollar figures for personal income are inflated in 1973 and subsequent years by the inclusion of all money distributed by the Federal government to the Native corporations created under the Alaska Native Claims Settlement Act, although only a part of these payments was passed on to individuals by the corporations. The share retained by the corporations was not personal income. The most pronounced effect of this procedure is seen in 1973, when per capita personal income in the Nome census division (unadjusted) jumped to $5573 compared to $3126 the preceding year. By 1978, the effects of this statistical anomaly are somewhat diminished. Another important aspect of the definition of the per capita income figures is that they include no estimate of the value of food obtained from subsistence hunting and fishing.

Table III.D.2.f.-2
Per Capita Incomes in the Nome Census Division
Compared to U.S. Per Capita Incomes

	1971	1972	1973	1974	1975	1976	1977	1978	1979
Per Capita Personal Income of Residents of the Nome Census Division									
(1) Unadjusted	2,819	3,126	5,573	5,095	6,045	6,579	6,447	6,615	7,223
(2) Adjusted by Ratio of Living Costs in Area to U.S. Average	1,253	1,434	2,580	2,316	2,628	2,800	2,791	2,839	3,210
(3) Adjusted by Changes in Living Costs Over Time (Constant 1979 Dollars)	5,264	5,708	9,609	7,757	8,198	8,379	7,762	7,280	7,223
(4) U.S. Per Capita Income	4,166	4,495	4,981	5,428	5,861	6,401	7,035	7,846	8,757
(5) Ratio: Unadjusted Nome/ U.S. Per Capita Income - (Line 1/Line 4)	0.68	0.70	1.12	0.94	1.03	1.03	0.92	0.84	0.82
(6) Ratio: Nome/U.S. Per Capita Income, After Adjustment for Higher Living Costs in Nome - (Line 2/Line 4)	0.30	0.32	0.52	0.43	0.45	0.44	0.40	0.36	0.37

Sources:

(1) The unadjusted per capita personal income figures for the Nome census division are those published by the U.S. Bureau of Economic Analysis.

(2) The adjusted per capita income figures in Line 2 equal the figures in Line 1 divided by the product of two ratios. The two ratios are: living costs in Anchorage, Alaska/average U.S. living costs, and living costs in Nome/living costs in Anchorage. The first ratio is based on figures for "annual (intermediate) budgets for a four-person family" published by the U.S. Bureau of Labor Statistics. The second ratio is based on a one-time study which indicated that in 1976 living costs in Nome were approximately 65 percent higher than in Anchorage, Alaska. The adjusted figures in Line 2 reflect the assumption that Nome living costs were approximately 65 percent higher than Anchorage living costs in all years 1971-1979, and therefore must be interpreted with caution. The 1976 study of comparative living costs in Nome and Anchorage was conducted by the Institute of Social and Economic Research, University of Alaska, and results were published in Alaska Interregional Costs Differentials (Center for Northern Educational Research, 1977) and in Numbers - Basic Economic Statistics of Alaska Census Divisions (Alaska Department of Commerce and Economic Development, 1979).

(3) Cost-of-living figures used to compute constant dollar per capita income figures presented in Line 3 are the Consumer Price Indexes for Anchorage (All Urban Consumers) published by the U.S. Bureau of Labor Statistics. No Consumer Price Indexes are published for the Nome area, and the Anchorage CPI figures are probably the most appropriate available indexes. Nonetheless, the constant dollar figures in Line 3 must be interpreted with caution, because there could be significant differences in the Nome and Anchorage patterns of price level changes over time. (At any one time, price levels in the Nome area are about 65 percent higher than in the Anchorage area.)

(4) The U.S. per capita personal income figures in Line 4 are those published by the U.S. Bureau of Economic Analysis.

Explanation of Significance of Table III.D.2.f.-2

Table III.D.2.f.-2 shows, in Line 3, changes over time in the purchasing power of residents of the Nome area. The increase in price-level adjusted per capita income from $5,264 in 1971 to $7,223 in 1979 (constant 1979 dollars) indicates an increase of 37 percent in per capita purchasing power. This represents an average annual compound growth of 4.0 percent from 1971 to 1979.

Figure in Line 6 indicate changes in the comparative economic well being of residents of the Nome area, relative to other U.S. residents. In 1971, Nome residents possessed roughly 30 percent as much per capita purchasing power as other U.S. residents. In 1979, Nome area residents possessed about 37 percent as much purchasing power as other U.S. residents.

Information about two additional aspects of the per capita income figures presented above is necessary for a realistic interpretation. First, the dollar figures for personal income are inflated in 1973 and subsequent years by the inclusion of all money distributed by the Federal government to the Native corporations created under the Alaska Native Claims Settlement Act, although only a part of these payments was passed on to individuals by the corporations. The share retained by the corporations was not personal income. The most pronounced effect of this procedure is seen in 1973, when per capita personal income in the Nome census division (unadjusted) jumped to $5,573 compared to $3,126 the preceding year. By 1978, the effects of this statistical anomaly are somewhat diminished. Another important aspect of the definition of the per capita income figures is that they include no estimate of the value of food obtained from subsistence hunting and fishing.

For residents of all of the smaller communities within the census division, subsistence activities continue to be the principal economic basis for living.

g. Future Outlook: In the absence of OCS development, Nome would continue to serve as the transportation, trade, and government center for the region; and gold mining would continue at the present level of activity. There would be some increases in commercial fishing and tourism. Reindeer herding would probably continue at present levels on the Seward Peninsula and on St. Lawrence Island. The forests along the northern side of Norton Sound could support a full-time sawmill to help supply lumber for construction in Nome and elsewhere throughout the region. A small sawmill has operated sporadically at Elim. In the past, small quantities of vegetables have been grown on the Seward Peninsula; and it is conceivable that this might be done commercially in the future, as well as for subsistence.

Even without petroleum development, a much improved port facility is expected to be operational at Nome by the end of 1983. The port would consist of a 3,600-foot causeway with berthing and loading facilities at its seaward end and container, general cargo, and bulk handling facilities onshore. The new terminal is intended to accommodate a 30-foot vessel design draft and would be capable of servicing oceangoing barges, commercial fishing boats, tug boats, and petroleum industry workboats.

Several areas of the well-mineralized Seward Peninsula have been the object of recent exploration activity, and some additional production of hard minerals is a probability before the year 2000. This additional minerals activity could occur near Nome, or at some other place within the Nome census division. Another possibility is that mining activities outside the Nome census division, at some point inland from the Seward Peninsula, could result in construction of a highway or railway to tidewater at Nome, or at some new port on the Seward Peninsula. A deepwater port for the shipment of minerals could be constructed in the Lost River area, or possibly at Golovin. Of course, minerals in areas inland from the Seward Peninsula might be shipped by rail to Fairbanks rather than westward to tidewater. The economic pace of the Nome census division would be speeded either by additional mining activities within its own borders or by any large scale development further inland which resulted in shipment of minerals to tidewater on the Seward Peninsula.

Presently unused energy resources exist on the Seward Peninsula in the form of wind power and geothermal resources. Experimental use of windmills by the University of Alaska is underway in the city of Kotzebue, just north of the Seward Peninsula. If the equipment now being tested at Kotzebue proves to be cost efficient, it could be put in use at many locations on the Seward Peninsula, which has a high incidence of winds. High geothermal potentials exist in the Imuruk lava field area, at Pilgrim Springs north of Nome, and at the Serpentine Hot Springs in the upper part of the Peninsula.

By the year 2000, population in the Nome census division is expected to increase by 26 percent over the 1981 level. Employment is expected to increase by about 22 percent, causing the employment/population ratio to decline slightly. (See Table IV.B.3.b.-2.) This small projected decline suggests that the overall economic well being of residents of the Nome census division could

not be expected to improve much above present levels in the absence of OCS development.

The preceding projections are based on an assumption of only small increases in hard minerals production, probably occurring in the immediate area of Nome. If hard minerals development on the Seward Peninsula brought about construction of a deepwater port elsewhere than at Nome, or if inland minerals were brought to tidewater anywhere on the Seward Peninsula, economic development would be at a higher rate than presently projected. Other economic development possibilities which would increase economic growth above the rates presently projected include onshore petroleum development or the development of petroleum resources under the State of Alaska's territorial waters (within 3 miles of shore) which could result from a planned lease offering early in 1983. Neither of these possibilities is certain, and the likely impacts of either or both are believed small compared to the OCS activity tentatively planned for the area.

Due to federal government policy changes in 1981, welfare and food stamp program benefits to persons in the area affected by sale 57 have been reduced, thereby decreasing personal income from the levels which would have been expected if welfare and food stamp programs had been maintained at previous levels. In addition, federal cutbacks in the Comprehensive Employment and Training Act (CETA) program will certainly decrease employment opportunities, particularly among Native (Eskimo) residents of the area affected by sale 57.

In the absence of the proposed offshore petroleum development, subsistence hunting and fishing activities based on the wildlife resources of the area will continue to be the economic basis of living for the majority of the population of the Nome census division. This reliance on subsistence economic activities will be increased by the recent (1981) federal government expenditure cutbacks in welfare and food stamps and cutbacks in the CETA program, which provided direct employment to many Native persons and prepared others for wage and salary employment by providing job-related training.

E. Other Issues

The following were neither identified in the scoping process nor in the assessments as significant issues for this proposal. Therefore, they will be described briefly and discussed in Section IV (Environmental Consequences) as appropriate. Included in this section are: cultural resources; visual, wilderness, and recreational resources; transportation systems; coastal zone management; land status and land use; and water and air quality.

1. Cultural Resources: The predominant types of prehistoric resources found on the shores near the proposed sale area are housepits containing the household and subsistence artifacts of early people (stone lamps, sinkers, arrowheads, etc.). Historic artifacts found onshore near the proposed lease sale area consist of old houses, roadway inns, fish camps, mining camps, downed World War II aircraft, and other reminders of historic times. (Refer to Table III.E.1.-1 for National Register sites.) For a more detailed analysis of cultural resources, see Alaska OCS Technical Paper No. 2, Bering Sea Cultural Resources, and Leicht (1980). (Also refer to Graphic No. 7.)

Submerged artifacts, if found, would be similar to those listed above (burins, stone, arrowheads) and may have been scattered by tidal currents and geological

Table III.E.1.-1

National Register Nominations in Proposed Lease Sale 57 (Norton Sound) Areas

AHRS File No.	Name	Date of Site	Date on Register
TEL 021	Norge Storage	1926 AD	NHR 10/09/74
TEL 025	Hillside Site	No Date	NHS 12/29/62
TEL 026	Beach Site	No Date	NHS 12/29/62
TEL 031	Birnirk Burial Mound	500 AD	NHS 12/29/62
TEL 054	Iyapana House	No Date	NRE 11/16/73
TEL 079	Kurigitavik Mound	No Date	NHS 12/29/62
NOM 021	Anvil Creek Dist. Site	1898 AD	NHR 12/21/65
NOM 032	McClain Home	1900 AD	NHR 12/19/78
NOM 038	Lindbloom Placer Creek	1898 AD	NHR 12/21/76
SOLO 031	Solomon Roadhouse	1904 AD	NHR 03/22/79
SOLO 069	Cape Nome Roadhouse	1900 AD	NRE 12/12/76
NOB 002	Iyatayet	5000 BC	01/20/61
UKT ---	None Listed	---	---
SMI 014	Trading Post or Redout St. Michael	1833 AD	04/01/76
SMI 015	US Fort St. Michael	1897 AD	04/01/76
KWI ---	Kwigluk None Listed	---	---
BLK ---	None Listed	---	---
XSL 001-005	Punuk and Eskimo Sites	1000-1700 AD	NHS 12/29/62

Code:
NHR - National Register of Historic Places and date.
NHS - National Historic Site (within NHR District) and date.
NRE - Date eligible for National Register as determined by the Secretary of the Interior.
NHL - National Historic Landmark date.

Source: Alaska Heritage Resources File, 1980.

DISCLAIMER: THIS VISUAL GRAPHIC HAS BEEN PREPARED FOR AN ENVIRONMENTAL IMPACT STATEMENT (EIS). IT IS BASED ON AVAILABLE DATA SOURCES AND IS NOT A PRODUCT OF ORIGINAL SCIENTIFIC RESEARCH. THIS IS A SPECIAL PURPOSE GRAPHIC DEPICTION AND IS NOT TO BE USED FOR NAVIGATION PURPOSES. NOR IS THIS GRAPHIC A SUBSTITUTE FOR LEGAL LEASING PURPOSES. THE BUREAU OF LAND MANAGEMENT, U.S. DEPARTMENT OF THE INTERIOR DOES NOT GUARANTEE THE ACCURACY TO THE EXTENT OF RESPONSIBILITY OR LIABILITY FOR ANY REUSE. HORIZON PREPARED BY THE ALASKA OUTER CONTINENTAL SHELF OFFICE, ANCHORAGE, ALASKA

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Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

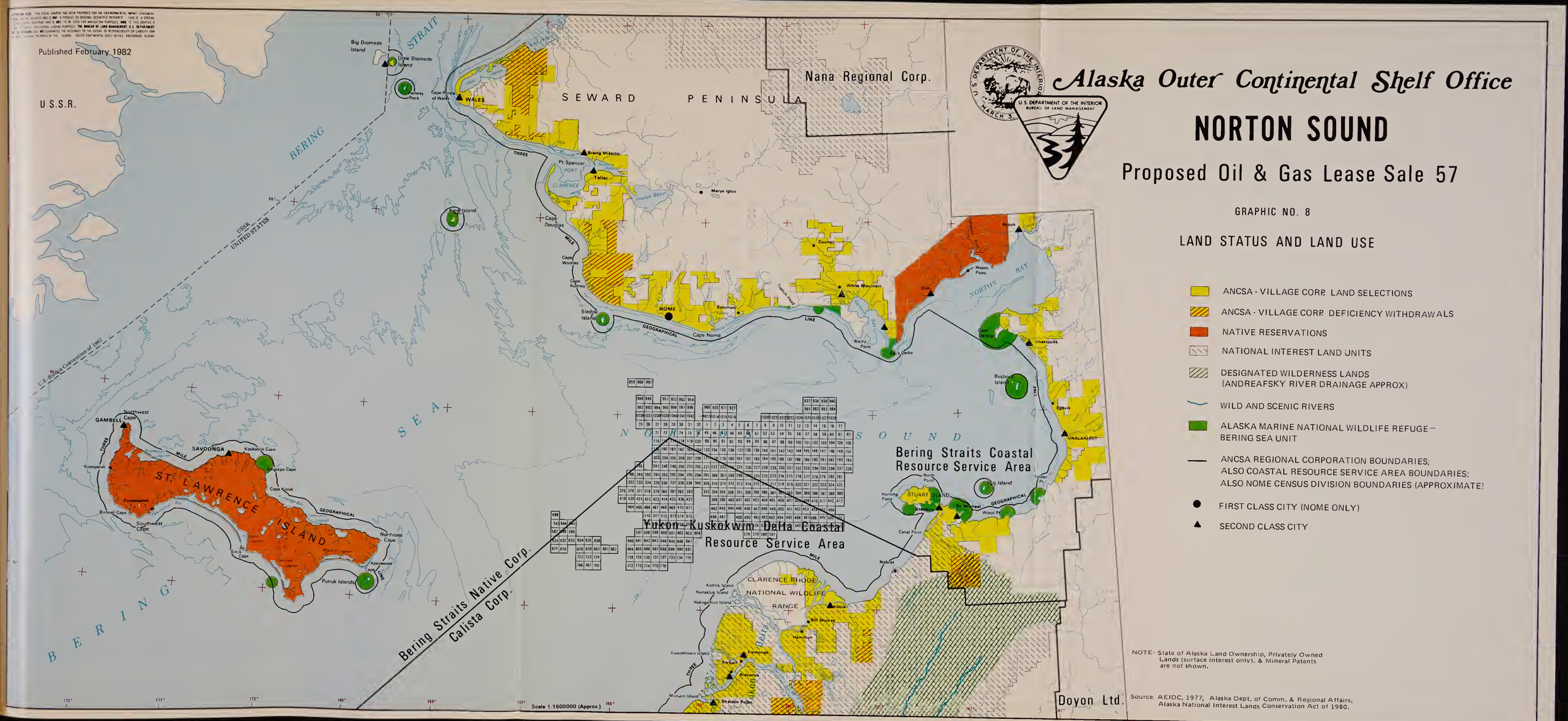
GRAPHIC NO. 7

CULTURAL RESOURCES

- NATIONAL REGISTER SITES**
- KNOWN SITES** (numbers indicate number of known sites)
- MEDIUM PROBABILITY OF HUMAN HABITATION SOMETIME IN PREHISTORY*
- LOW PROBABILITY OF HUMAN HABITATION SOMETIME IN PREHISTORY*

Source: ** Alaska Heritage Resources Survey, Division of Parks, State of Alaska.
* BLM, OCS Study No. 08550-CT5-45 Bering Land Bridge Cultural Resource Study.

Scale 1:1500000 (Approx.)



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MARCH 3, 1849

Alaska Outer Continental Shelf Office

NORTON SOUND

Proposed Oil & Gas Lease Sale 57

GRAPHIC NO. 8

LAND STATUS AND LAND USE

- ANCSA - VILLAGE CORP. LAND SELECTIONS
- ANCSA - VILLAGE CORP. DEFICIENCY WITHDRAWALS
- NATIVE RESERVATIONS
- NATIONAL INTEREST LAND UNITS
- DESIGNATED WILDERNESS LANDS (ANDREAFSKY RIVER DRAINAGE APPROX)
- WILD AND SCENIC RIVERS
- ALASKA MARINE NATIONAL WILDLIFE REFUGE – BERING SEA UNIT
- ANCSA REGIONAL CORPORATION BOUNDARIES; ALSO COASTAL RESOURCE SERVICE AREA BOUNDARIES; ALSO NOME CENSUS DIVISION BOUNDARIES (APPROXIMATE)
- ● FIRST CLASS CITY (NOME ONLY)
- ▲ SECOND CLASS CITY

NOTE: State of Alaska Land Ownership, Privately Owned Lands (surface interest only), & Mineral Patents are not shown.

Source: AEIDC, 1977; Alaska Dept. of Comm. & Regional Affairs; Alaska National Interest Lands Conservation Act of 1980.

changes (Hopkins, 1967). It is estimated that less than 1 percent of all rig emplacement surveys would locate these artifacts, since only large anomalies, 1 meter or larger, can be distinguished with side-scan sonar. Magnetometers detect only metal objects and these, if found, would most likely be from historical objects. It is estimated that less than 2 percent of all surveys for rig emplacements might locate a sunken ship within the boundaries of the proposed sale area.

In OCS research on underwater sites of human habitation, Dixon, Sharma, and Stoker (1976) suggested that underwater archaeological sites could probably be found by applying similar reasoning as to why villages are located where they are today. That is, there must be food available that can be obtained in sufficient quantities to be stored for the winter. This would imply locations along the shore of the Bering Sea, on the rivers and their valleys, and on the slopes of hills facing south. From studies of the bathymetry of the underwater landscape, probabilities were suggested for human habitation. These were applied to all blocks underwater. One can find these mapped in the report of Dixon, Sharma, and Stoker (1976).

Hopkins suggested that these would be very difficult to verify because of the dynamic aspects of the Bering Sea region. There are some regions, however, where the dynamics, including ice gouging, do not occur (Hopkins, 1967); and possible sites could exist in these areas. Because of murky water and dangerous diving conditions, known means of surveying these areas do not produce good results.

Eustatic sea level changes over the past 10,000 years have caused the coastline of the continent to change drastically. What was once the shoreline may now be under water. The Bering Land Bridge no longer exists between Siberia and Alaska. In places such as the Bering Strait, extremely fast currents have no doubt moved the remains of past human cultures. Yet, in less dynamic areas under the water, some remains may be in existence. The probability of this has been addressed in a study by Dixon, Sharma, and Stoker for the Bering Sea area. However, due to the difficulty of surveying and interpreting surveys with present technology (side-scan sonar and magnetometer), the Heritage Conservation and Recreation Service (HCRS), now in National Park Service, prefers to sample cores of any drilling done on the outer continental shelf and examine USGS bottom-survey results. They also have suggested doing drill studies under known conditions to determine the effectiveness of finding archaeological remains.

In addition to submerged archaeological sites, numerous shipwrecks lie on the sea floor. In the early Russian period, an average of nine ships a year were sent from Russia to the Bering Sea; three of every nine were lost. Those losses were attributed to poor marine engineering, coupled with unpredictable winds, freqent sea storms, general ignorance of climatic conditions, and navigational hazards in coastal areas and shoal waters. Often, vessels were trapped by ice in the Bering Sea; and, before winter was over, they were crushed or had to be abandoned. Tidal currents, the fast flow of water through the Bering Strait, and ice gouging may have destroyed those under water in that area, but some may yet remain preserved in other areas. Shipwrecks in the Bering Sea are: Illinois, wrecked in 1876; Cleone, wrecked in St. Lawrence Bay in 1877; Rainbow, wrecked in 1885; Napoleon, wrecked in 1885; and John Carver, wrecked north of St. Lawrence Island.

2. Visual, Wilderness, and Recreational Resources: The State Division of Parks and the Federal-State Land Use Planning Commission have identified certain areas in the Norton Sound region which have visual, wilderness, and recreational resource values (Alaska DNR, Division of Parks, 1976; Joint State-Federal Land Use Planning Commission, 1978). The Kigluaik Mountains to the north of Nome are visually and scenically distinctive. The historic community of Nome, in terms of design and character of its buildings, is visually significant. The upper drainage of the Unalakleet River is scenic and the entire coastline of the Norton Sound region has visual and scenic value of varying quality.

The Norton Sound, Yukon Delta, and Seward Peninsula areas have wilderness qualities considering the sparse settlement activity. Nome is the only incorporated community (first-class city) besides several incorporated Native villages (second-class cities). All of these villages are located in the coastal zone. Evidence of man's intrusion in the proposed sale area include (a) mine tailings along the foothills of the Kigluaik Mountains; (b) various artifacts from previous settlements and extractive operations, e.g., vessel wrecks, debris, etc.; (c) trails and routes visible in tundra and wetland environments; and (d) current maritime commerce and subsistence utilization of coastal areas. This evidence of human activity technically disqualifies much of Norton Sound and the Yukon Delta from legislative wilderness designation.

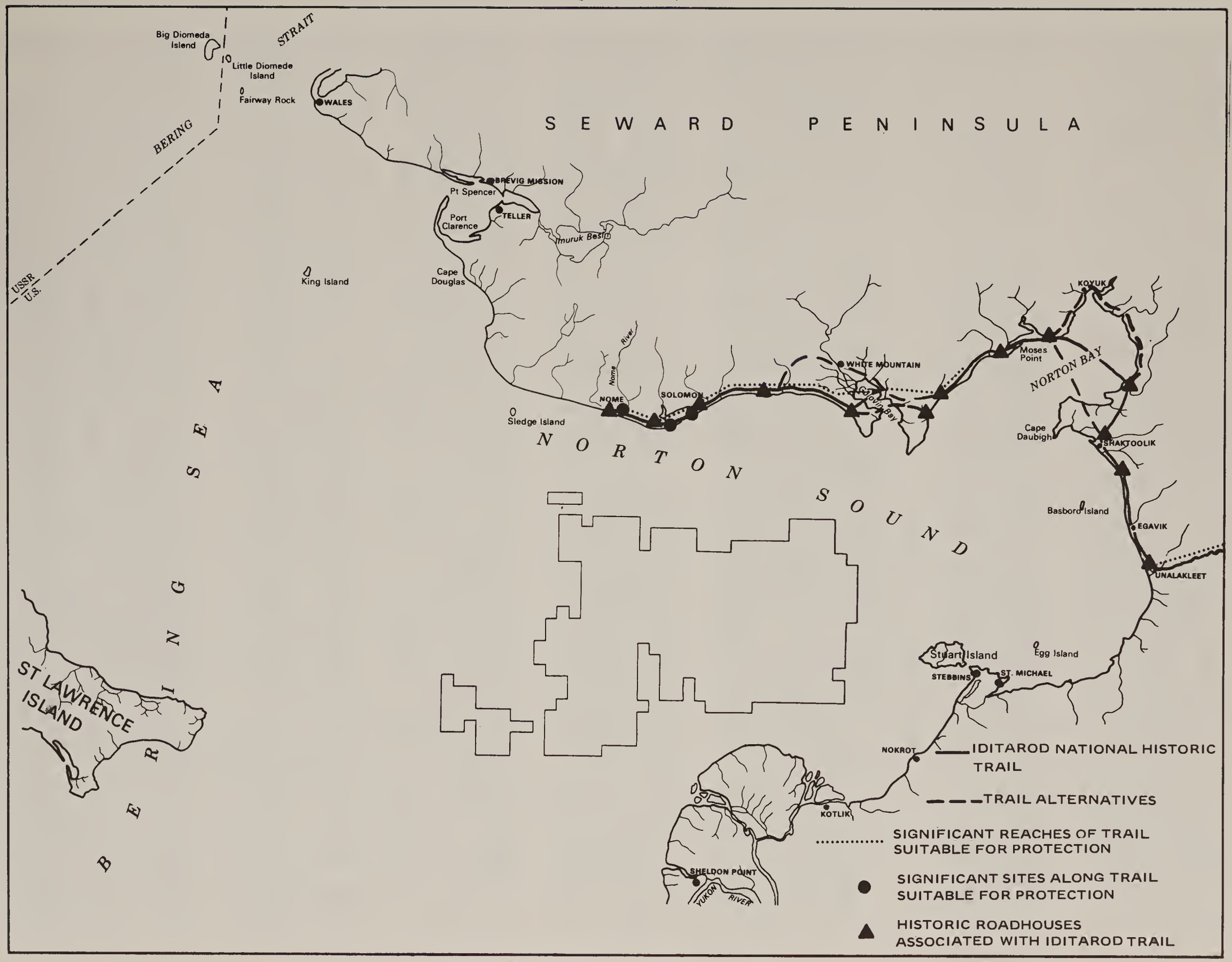
The provision of the Alaska National Interests Lands Conservation Act does not include creation of any wilderness units within the coastal region of Norton Sound. The act does authorize creation of the Andreafsky Wilderness of approximately 1,300,000 acres within the Yukon Delta National Wildlife Refuge (created separately by the act). However, this area is located inland at least 15 miles from the southern coastline of the Norton Sound-Pastol Bay region. (Refer to Graphic No. 8.)

One of the most significant recreational events in the proposed sale area is the annual Iditarod race. This race involves teams of dog mushers who travel over 1,000 miles from Anchorage to Nome. The race commemorates the historic Iditarod trail which was developed to support surface transportation to the interior and Nome during the gold rush days. The modern Iditarod trail has been designated a National Historic Trail by Congress (16 U.S.C. 1241). A comprehensive plan is being prepared for the Iditarod National Historic Trail pursuant to this federal statute. A draft version of the plan includes recommendations for protection and management of the trail (BLM, 1981).

Figure III.E.2.-1 identifies the trail route in or near Norton Sound. Certain reaches of this route are recommended for protection of any activity from development which would alter the recreational and historic features of the trail system. Note that the trail segments from Nome to Elim and from Unalakleet to Kaltag are "most significant" for management purposes. Also, three sites--the city of Nome, the Cape Nome Roadhouse, and the Solomon Townsite and Roadhouse--are also "most significant" for management purposes. Refer to Section IV.H.2. for further discussions of the Iditarod trail management plan and the means available to protect the trail.

Recreation programs in Nome are organized by the Nome community center. These include organized and intramural sports for school children, adult softball league, day camp, summer program, ice rink and ice skating programs, community

Figure III.E.2.-1



IDITAROD NATIONAL HISTORIC TRAIL

arts and crafts classes, and cross-country skiing, among other programs. Special recreation events include the Iditarod race in March and the Midnight Sun Festival in June. Municipal recreational facilities generally meet or exceed the standards recommended by the National Parks and Recreation Association for a community the size of Nome (BLM, 1980). Discussions of recreational activities and facilities in the city of Nome and its vicinity are contained in the Socioeconomic Studies Program (SESP) Technical Report No. 53.

For both Native and non-Native elements of the Nome population, subsistence hunting, fishing, and renewable resource harvest is a form of recreation. This activity occurs seasonally with the species or resource of interest. Refer to Section III.B.3. for a discussion of subsistence use and dependence patterns in Nome and among Native villages in the Norton Sound region.

3. Transportation Systems:

a. Marine Transportation: Marine transportation in western Alaska provides an important service during a limited summer operating season. Virtually all commodities having low value-to-weight ratios such as construction materials, petroleum products, and transportation and construction equipment, are moved over water to and within western Alaska. With the exception of personal travel by small outboard motorboats, marine transportation in western Alaska is exclusively freight-oriented (Western Alaska Arctic Transportation Study, 1979).

Marine transportation service consists of two types in western Alaska: ocean going barges and ships that move products from Seattle to transshipment points in Alaska (e.g., Anchorage and Dutch Harbor) and in Norton Sound. From the transshipment point, lightering vessels and tugs must bring goods into the improved harbor at Nome or over the beach for other coastal communities in Norton Sound.

The shipping season in Norton Sound generally runs from May 1 to the end of September, approximately 5 months. Common and contract barge carriers and contract lighterage carriers serve several communities in Norton Sound and the Yukon Delta. Communities served include Nome, Unalakleet, St. Micheal, Golovin, Solomon, Port Clarence, Emmonak, Kotlik, Teller, Savoonga, Gambell, Shaktoolik, and Elim.

Nome is the only settlement in the proposed sale area with an improved port. However, because of extensively shoaled beaches, lightering of goods is still required to bring them into the port. Incoming general cargo has fluctuated between 6,000 and 10,000 tons per year for the period 1969-1979. Liquid petroleum tonnage to the port of Nome fluctuated between 19,000 and 30,000 tons in the same period.

The city of Nome has proposed to build a deep draft causeway port to improve its maritime commerce and the general economic base of the Norton Sound region. A Corps of Engineers permit for dredge and fill has been filed with the Alaska District, Corps of Engineers (COE, 1980). The marine terminal is intended to accommodate a 30-foot vessel design draft, including ocean-going barges, commercial fishing vessels, tug boats, and petroleum industry workboats. The port/causeway would be sited at the west end of the city limits on an elevated plateau that is bordered on the north and the east by the Snake River. The

port would consist of a 3,600-foot causeway with berthing and loading facilities at its seaward end and with container, general cargo, and bulk-handling facilities located onshore. The State Department of Transportation and Public Facilities has recommended an appropriation of funds in both fiscal years 1982 and 1983 to pay for the capital costs of the port facility. The city expects its port facility to be operational by the end of 1983 (Tetra Tech, 1980 and 1981).

b. Air Transportation: Air transportation in western Alaska provides an important year-round service. Aircraft landing facilities are found throughout the Norton Sound area. Many are privately owned. Scheduled airline services are available to Nome and Unalakleet. Other airfields in Norton Sound and the Yukon Delta are served by contract carriers and air taxi operators.

The Nome airport is operated by the State of Alaska and is capable of handling jet traffic. The airport handled 59,000 operations in 1978. The breakdown of FY 1978 operations is as follows: air carriers, 14 percent; general aviation, 51 percent; air taxi, 25 percent; and training, 10 percent. The FAA has determined that the airport was operating at 35 percent of capacity operations in 1978. The State Department of Transportation and Public Facilities has contracted for an airport improvements plan (FAA/Pharr, 1981), following the recommendations of an FAA 10-year plan for Alaska airports (FAA, 1979).

The Unalakleet airport is owned and operated by the State of Alaska. The airfield includes a 6,000-foot gravel runway and is defined as an air carrier airport. One scheduled carrier serves the airport. Air taxi operations are the predominate use of this airport. Operations in 1978 amounted to 16,000 of the capacity 270,000 operations as determined by the State Department of Transportation and Facilities.

Other settlements in the Norton Sound and Yukon Delta region have gravel or dirt airstrips which are suitable for air taxi and small contract carrier service. These airfields are typically unattended and operated on a VFR (Visual Flight Rule) basis only.

c. Surface Transportation: The surface road network in the proposed sale area includes only two routes as part of the state highway system. A road from Nome to Teller (approximately 60 mi) is maintained year-round; and a second route from Nome to Solomon (approximately 30 miles) near

the Safety Sound area which is maintained seasonally. During the winter period, the state maintains a road between Nome and Solomon, about 7 miles out of Nome.

Further discussion of the marine, air, and surface transportation modes in Norton Sound and the Yukon Delta areas is provided in SESP Technical Report No. 52 regarding transportation systems analysis (BLM, 1980).

4. Coastal Zone Management:

a. State Coastal Management Program: The Alaska Coastal Management Program (ACMP) was initiated in 1974 in response to the opportunity for coastal planning provided under the Federal Coastal Zone Management Act

(CZMA) of 1972 (Alaska Office of Coastal Management and U.S. Department of Commerce, 1979). The Alaska legislature adopted the Alaska Coastal Management Act (ACMA) in 1977 as enabling legislation for submission and adoption of the ACMP (AS 46.40.010, et seq.). The ACMA establishes the Alaska Coastal Policy Council for policy guidance in administration of the ACMP. The act requires boroughs and first-class cities to prepare District Coastal Management Programs (CMP).

Under provisions of the ACMA, areas of the Unorganized Borough may participate in the ACMP. Participation begins when constituents of a geographic unit within the Unorganized Borough vote to establish a Coastal Resource Service Area Board (CRSA). The CRSA boards are authorized to prepare and adopt a district CMP for the coastal area within their jurisdiction. However, the ACMA does not provide authority to implement a plan for a CRSA, as it did not convey any powers of general purpose government to the Unorganized Borough. The CRSA boards must, therefore, rely on state authorities and regulations for implementation of a district CMP within the Unorganized Borough.

The Alaska Coastal Policy Council has adopted guidelines and standards for the use of coastal resources. These guidelines and standards are the principal regulatory component of the ACMP, and the Coastal Policy Council uses them to evaluate the acceptability of CMPs. In the absence of an approved CMP, either in the incorporated area or within the Unorganized Borough, the state must refer to the council's guidelines and standards, along with other provisions in its approved ACMP, to evaluate the suitability of the proposed actions in the coastal zone.

The ACMP is not in itself a land and water use plan for geographically specific areas; the ACMP does not categorically allow or disallow specific types of actions in designated reaches of the coastal zone. Instead, the ACMP is a management process which results in site-specific decisions.

b. Energy Facility Siting Process and Uses of State Concern: Of significance to this lease sale proposal are provisions in the ACMP regarding the siting of energy facilities and the accommodation of land and water uses of state concern. The guidelines and standards of the Coastal Policy Council state in part that, "Sites suitable for the development of major onshore, nearshore, offshore, and outer continental shelf energy facilities must be identified by the State in conjunction with districts (6 AAC 80.070)." The approved ACMP includes an "Energy Facility Planning Process" as guidance for district coastal management programs satisfying the above requirement (Alaska Office of Coastal Management and U.S. Department of Commerce, 1979).

The ACMA has separate requirements for uses of state concern, of which energy facilities are an identified category (AS 46.40.210(6), AS 46.40.060(a), and AS 46.40.070(c)). The ACMA requires a district CMP to "not arbitrarily restrict or exclude uses of State concern (AS 46.40.060(a))." The act sets forth three tests which must be met if a district program can reasonably restrict or exclude the use of state concern. These provisions in the ACMA, together with the Energy Facility Planning Process of the ACMP, assure that siting of energy facilities in the coastal zone would be the subject of a rational planning process.

c. ACMP, the OCS National Lease Schedule, and the Leasing Process: The State of Alaska recently submitted official comments to the Secretary of the Interior in response to a DOI request for comments on revisions to the national OCS leasing schedule. In this submittal, the state made the following pertinent statements regarding the timing of OCS leasing and operations in the context of coastal management planning in western Alaska (State of Alaska, 1981):

(1) The state considers proposed OCS sale 57 to be premature under the existing schedule. OCS leasing in the Norton Basin "may be appropriate in the latter part of the 1980 to 1985 period," contingent upon specific conditions: (a) proven technology for petroleum development is available; (b) onshore infrastructure is available; (c) sufficient time is allowed for local coastal management plans to be satisfactorily completed; and (d) progress and transportation methods and measures designed to mitigate potential adverse effects are demonstrated.

(2) The state recommends that proposed OCS sale 57 be postponed in a new OCS national leasing schedule, if such a schedule is to be prepared and adopted. With regard to coastal zone management, the preferred timing of a Norton Basin sale should follow the state's criteria set forth above. This recommendation is comparable to an earlier statement made by the Governor's Office, Division of Policy and Development Planning, in response to the Alaska OCS Office Call for Nominations on this proposal (State of Alaska, 1979).

(3) The state recommends that local coastal management planning be phased with the sequential nature of the OCS process:

> "In fact, there are three distinct phases to the OCS leasing and development process, and state and local planning must be attuned to all of these. These are the pre-sale, post-sale exploration, and post-sale development assuming there is a commercial find . . . .
>
> "During the pre-sale phase, which is where all of western Alaska currently is in the OCS planning process, there is much pressure for coastal management planning to address the need of all participants in the leasing process. There is also considerable pressure to resolve all conflicts at the time of local program adoption. This is unlikely to happen. The most likely type of coastal management planning we foresee being undertaken by a local government or coastal resource service area along the western coast of Alaska and the Aleutian Chain, during the current pre-sale phase, is to identify areas where they do not want impacts to occur or physical activity to take place. This would involve preserving areas from impacts rather than selecting areas for impacts. The latter aspect of coastal resource planning is, by far, more encompassing and useful to the public and the industry, but there is simply not enough information at this time since it is by no means assured that the exploration will indeed result in a commercial find. Only a find of that quantity would justify the cost of both information gathering and resultant planning which could realistically select sites for impact.
>
> Hence, during the current pre-sale phase in the OCS planning process, the best local governments can do is to plan according to

hypothetical scenarios. That is, they can develop a set of likely futures and prepare plans for each of them. This is expensive, time consuming, and potentially inefficient as the scenarios are based on limited data. A better option is to ensure that the three phases of OCS activity be clearly identified in local, state, and Federal processes, and that adequate information requirements and funding is available to ensure that proper planning occurs at the right time. The key is to incorporate "local readiness" to handle the impacts associated with the actual phase of OCS activity in question into the Federal decisionmaking process at this time." (State of Alaska, 1981.)

d. Nome District Coastal Management Program: As a first-class city, Nome is preparing a CMP for its incorporated townsite. Under Alaska local government law, first-class cities are empowered to prepare comprehensive plans and adopt zoning ordinances (Alaska Statutes, Title 29). Additionally, the district CMP is studying a much larger area from the Sinuk River to Cape Nome. This area includes approximately 65 miles of shoreline in comparison to the city's approximately 3 miles of coastline.

The city completed its draft CMP in July 1981, and the public hearing was held in October 1981. "Concept Approval" of the draft CMP is expected to follow. Review and approval of the plan by the state is expected by late spring after the city boundary issue is resolved. The city then has 90 days to adopt the plan by ordinance, thereby officially incorporating it into the ACMP (Alaska Office of Coastal Management, 1980). Refer to Figure III.E.4.-1 which depicts a "timeline" for development of the Nome CMP.

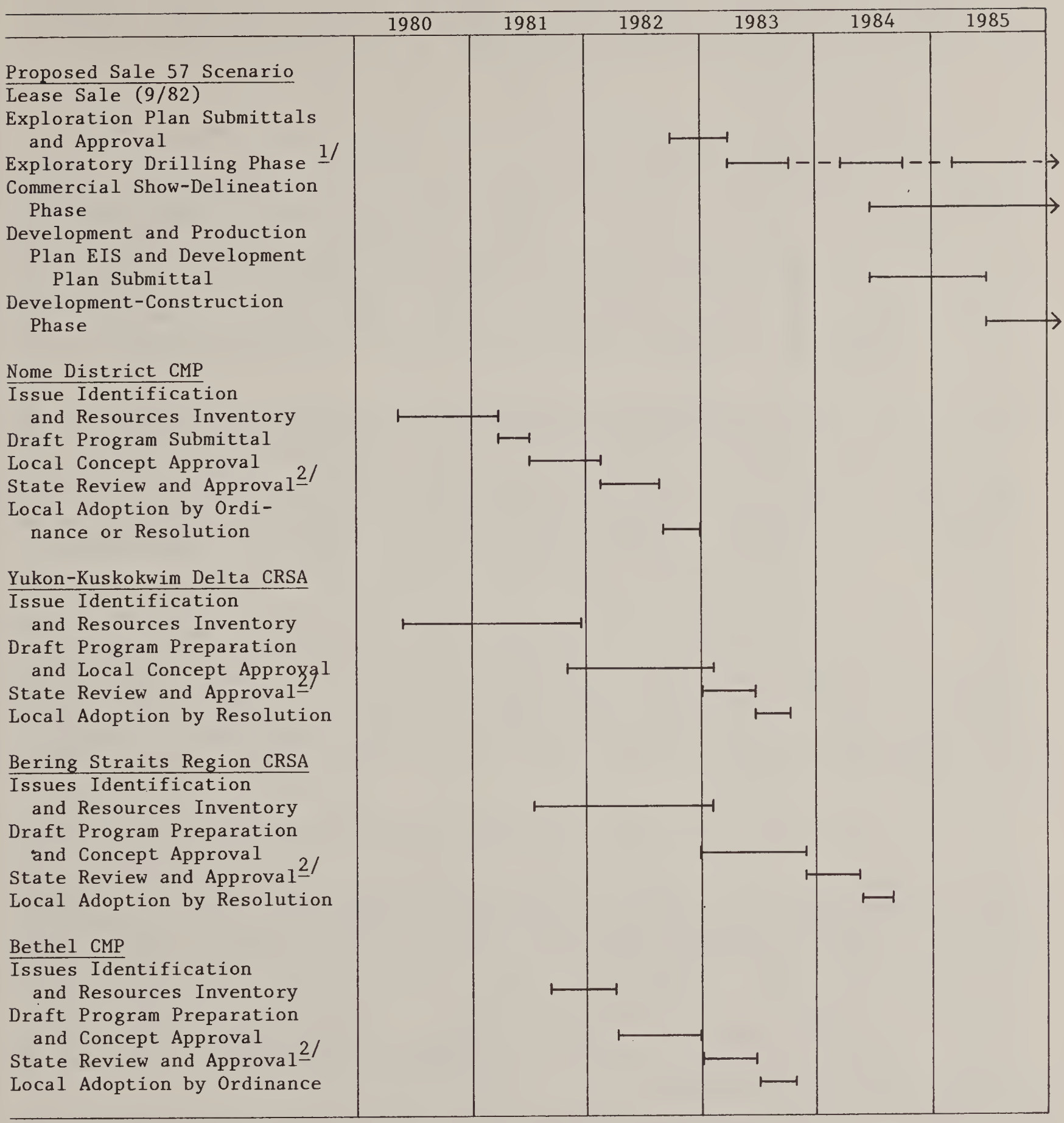
The city lacks an adopted policy regarding energy facility siting and derivative onshore impacts ensuing from OCS development. The city's Comprehensive Paln was never officially adopted, and its policy contents are not relevant to major industrial developments such as OCS facilities. (See Section III.E.5.) However, the city's draft coastal management program contains pertinent goals and policy statements. In general, the city plans to work with all parties to provide the support facilities and necessary infrastructure to encourage mineral and oil and gas exploration (ESL 1981b). Specifically, Nome has proposed energy facility policies which incorporate those of the State Coastal Policy Council plus policies directly applicable to the Nome area. The latter policies address:

Reviewing, commenting, and monitoring all OCS-related plans and developments and hiring local labor.

Encouraging housing which fills long-term needs and structure which other industris can reuse after the OCS boom and encouraging developers to assume the costs associated with the installation of temporary structures.

Reserving lands adjacent to the port facility for OCS related storage and staging areas.

Figure III.E.4.-1
Estimated Timeline for District Coastal Management Program
Development in Context of Proposed Sale 57 Development Scenario



1/ The possibility of year-round exploratory operations from artificial islands is indicated by the broken lines.

2/ Should an approved local coastal management plan contain policies or boundaries differ from those of the State CMP, the federal OCZM may consider the local program on amendments to the State CMP rather than routine program implementation. The amendment process could add substantial time during which federal agencies would rely only upon the federally approved ACMP. State agencies, however, would comply with the state approved local program.

Source: Alaska OCS Office; Alaska Department of Community and Regional Affairs, 1980.

Note: Timelines are drawn roughly to scale; 1 year equals 0.80+ inches.

Encouraging housing which fills long-term needs and structure which other industris can reuse after the OCS boom and encouraging developers to assume the costs associated with the installation of temporary structures.

Reserving lands adjacent to the port facility for OCS related storage and staging areas.

Additional site-specific coastal management policies for OCS development could be developed if the city were to annex the coastal areas in the Cape Nome vicinity. In the event of a Cape Nome enclave, cooperation with industry, Native corporations, and state and federal agencies will be necessary to assess impacts and associated costs to Nome. The costs of short-term OCS-related demands are to be borne by industry and governmental agencies--not the local residents (ESL 1981b).

e. Bering Strait Coastal Resource Service Area (CRSA): The Bering Strait region's CRSA was authorized in January 1980. A board was elected in April 1980, and meetings have been conducted since September 1980. The CRSA board has received coastal management planning grants from the State Department of Community and Regional Affairs to prepare a work program and program development application. (Refer to Figure III.E.4.-1, which depicts a timeline for the development of the Bering Strait CRSA Plan.)

The Bering Strait CRSA hopes to complete a plan within 2 years, or by June 30, 1983. The board's progress is expected to be slow, initially, because of the large region involved and the distances between the several small Native villages. The Bering Strait CRSA extends from the southwestern shore of Kotzebue Sound, includes the Seward Peninsula, and terminates in Pastol Bay on the south side of Norton Sound. (Refer to Graphic No. 8 for the boundaries of the Bering Strait CRSA.)

The city of Nome and the Bering Strait CRSA's could have prepared a joint CMP under procedures allowed by the ACMA. However, the residents of Nome chose not to participate in the formation of the CRSA and elected to pursue a separate CMP for the city. There is a potentially significant issue in the development of separate coastal management programs for Nome and the Bering Strait CRSA. For any major development occurring outside the Nome townsite, but subjecting the city to spillover effects, the Nome CMP would lack coastal management jurisdiction over such development. Although Nome's CMP includes a policy statement addressing spillover effects, the development would be the subject of state authority with policy guidance coming from the approved CMP for the Bering Strait region.

f. Yukon-Kuskokwim Coastal Resource Service Area (CRSA): The Yukon-Kuskokwim (Y-K) Delta CRSA board was authorized in 1979 and has been conducting meetings since that time. The first-year planning grant for FY 1981 was issued to Nunam Kitlutsisti as staff to the CRSA board. Consultants have been retained to prepare a resources inventory and issue identification by the end of June 1981. By this date, the CRSA board and staff will separately prepare goals and policy statements for direction of the planning

effort. The Y-K board will seek its second-year planning grant (FY 1982) in which it expects to draft its district CMP plan. The board is expected to obtain concept approval of its plan by early 1983. State review and approval is expected shortly thereafter. Refer to Figure III.E.4.-1 for depiction of the timeline on development of the Y-K plan.

Nunam Kitlutsisti has prepared the following draft goals statement; however, these have not been officially adopted by the Yukon-Kuskokwim Delta CRSA board (Nunam Kitlutsisti, 1981). Thus, these goals statements do not constitute official policy guidance for the Y-K CMP.

-Protect and increase the supply of subsistence resources; accord first priority to subsistence resource use over all other uses.

-Protect the habitat upon which renewable resources are based.

-Control development of non-renewable resources, including hydrocarbons, so as to minimize the adverse impact of such development upon renewable resources and cultural dependence upon those renewable resources.

-Encourage forms of government that implement the goals of the Yukon-Kuskokwim CRSA plan, and encourage formation of planning mechanisms that increase the role of residents in resources decisionmaking.

-Accommodate to the maximum extent possible national and state interests requiring development of resources within the Y-K CRSA.

The boundaries of the Y-K CRSA extend from Pastol Bay, north of the Yukon Delta, and southerly to the outer reaches of Bristol Bay at the Hagemeister Strait. The Y-K CRSA boundaries coincide with the Calista Corporation boundaries in the coastal zone. Refer to Graphic No. 8 for delineation of the northern Y-K CRSA boundary. Bethel has opted to develop a CMP independent of the Y-K CRSA. Work on the program is underway. Figure III.E.4.-1 depicts the timeline for developing the Bethel CMP.

Reference is made to resolutions passed by a conference on coastal zone management in the Unorganized Borough (Rural Alaska Coastal Management Conference, 1979). The conference resolved that OCS leasing offshore of Alaska be postponed 5 years or until coastal management districts and their plans are in effect.

5. Land Status and Land Use:

a. Norton Sound Region: For the most part, land status in the Norton Sound proposed sale area presently consists of federal and Native land ownership. The southern part of Norton Sound from approximately the Yukon Delta easterly to St. Michael is part of the Clarence Rhodes National Wildlife Range. The northern part of the Seward Peninsula is part of the Bering Land Bridge National Park. Various coastal islands, spires, and rookeries are a part of the Alaska Maritime National Wildlife Refuge authorized by section 303(1) of the Alaska National Interests Land Conservation Act. Refer to Graphic No. 8 for land status in the Norton Sound region.

Along the northern shores of Norton Sound, the coastline is frequently subject to mining claims. The location of mining claims, whether active or inactive, has been mapped by the Arctic Environmental Information and Data Center (AEIDC, 1979). Patented private lands with fee interest in surface estate only are sparse in western Alaska. Thus, the only patented private lands, excluding mineral patents, in the proposed sale area are situated in the city of Nome. Developed land use in the proposed sale area, for the most part, is restricted to established settlements. Graphic No. 8 shows the villages in the vicinity of Norton Sound. Some small-scale extractive industry activities are also present; hard rock mineral mining occurs near Nome and some proposed timber harvesting may occur in local areas on Native-owned lands in Norton Sound.

Native land entitlements authorized under the Alaska Native Claims Settlement Act (43 U.S.C. 1601) are in the process of being conveyed to eligible village corporations and the Bering Straits and Calista Regional Corporations. The Native land ownership pattern is rather complex. Reference is made to the Alaska Automated Land Records System (AALRS) of the Bureau of Land Management, Alaska State Office, for specific mapping of the Native land status in the Norton Sound and Yukon Delta regions (BLM, 1981). Land selections and conveyances under the Statehood Act have also been mapped by the AALRS.

The land selections made by village corporations in the Norton Sound and Yukon Delta regions reflect primary interests in coastal control and access, subsistence harvest of renewable resources, proximity to settlements, and a secondary interest in minerals extraction. The Bering Straits and Calista Corporations have had the major goal of acquiring coastal lands interspersed between village corporation selections so that control of coastal resources and land use would be possible (BLM, 1980).

Native settlement patterns on the lands of Norton Sound have historically been responsive to the availability of food sources, suitability of the environment in terms of natural hazards and health conditions, cultural ties to other tribes, and a nomadic characteristic. Native settlement patterns in the Yukon Delta area have been historically characterized by permanent communities and seasonal subsistence camps, which were riverine (including the sloughs of the delta) and coastal. Native land use and land status in the Norton Sound and the Yukon Delta areas are further discussed in the Socioeconomic Studies Program (SESP) Technical Report, Vol. 1 (BLM, 1980). Subsistence land use is also discussed in Section III.B.3.

b. City of Nome and Vicinity: The city of Nome prepared a Comprehensive Development Plan in 1968 (Alaska Consultants, 1968). The plan has never been officially approved by the city. The city's planning and land use development policy is manifested more on a case-by-case basis, rather than through the recommendations of the development plan prepared in 1968. The city currently expects to update its comprehensive plan through its ongoing District Coastal Management Program efforts. The city hopes to adopt a comprehensive plan, as well as a zoning ordinance which it presently lacks, when its CMP is completed and authorized. Refer to Section III.E.4. regarding coastal management planning for the city of Nome.

Major features of the 1968 Comprehensive Development Plan are referenced here. Since these features are restated in the Draft Coastal Management Plan, they

probably reflect Nome's current planning policies. Urban redevelopment is integral to the plan. This consists of replatting much of the city's developed area, providing for placement or rehabilitation of much of the substandard housing stock, and improving the utilities and services available to the developed area. The city's 1968 plan for industrial development identified three major industrial areas and recommended that future industrial development (through the planning period 1970-1985) remain in these areas. The three areas include: (1) an area lying west of the Snake River and within the old Nome townsite, (2) port-related development in land situated at the city's boat basin, and (3) the Alaska Gold Company's warehousing and equipment storage area located north of the developed part of town.

Most of the land within Nome's corporate limits is privately held either by the Alaska Gold Company as owner of mineral patents, or by individuals acquiring unrestricted deeds through the BLM Townsite Trustee. The city still retains parcels in the undeveloped eastern part of town. There are legal problems with right-of-way and easement interests within Nome, which are attributable to the platting of land.

Land status outside the city of Nome is primarily determined by mineral claims and implementation of the Alaska Native Claims Settlement Act (ANCSA). Virtually all of the area around the Nome townsite is tied up in patented and unpatented mining claims. Patented claims amount to 40,000 acres, and Alaska Gold Company is the major landowner. Under the terms of ANCSA, the Sitnasuak Native Corporation (a village corporation representing the Nome area) selected nearly all of the land in the vicinity of Nome not already patented. Of significance to potential OCS onshore facilities is Sitnasuak Corporation's selection of 22 miles of Norton Sound coastline, from the west of Nome to Cape Nome. The conveyance of Native corporation lands has proceeded slowly because of easement problems.

The city of Nome has undertaken annexation proceedings several times since statehood. The city recently proposed to annex a large area extending easterly from the Sinuk River to Cape Nome. The State Boundary Commission recommended denial of this request and the state legislature has also denied authorization of the annexation request (Alaska Local Boundary Commission, 1981). In addition to enlarging the city's tax base, the city of Nome's officials consider the annexation most important because it would provide for area-wide planning and zoning authority (City of Nome, 1980). Nome's annexation proposals have been opposed by the Alaska Gold Company and various Native corporations. Annexation efforts were partially resolved with the discovery of the boundary description used in 1901 incorporation. The new boundary expands Nome jurisdiction from an area less than 1 square mile to more than 3 square miles. Plans to annex additional areas, however, have been resubmitted to the Boundary Commissions. Refer to Sections III.B.5. and III.E.4. for further discussions of Nome's annexation proposals.

Residential land use development is a serious problem within the Nome townsite and on lands contiguous to the city limits. There has been a shortage of platted land available for residential use. Private owners are reluctant to sell, preferring to hold on to large parcels for purposes of speculation, or to retain land for mineral extraction use. The city owns platted parcels but refuses to sell them until it has financing and the means to extend utilities and roads to the parcels. Thus, infrastructure costs and problems are a

critical factor to development of residential parcels inside and outside of Nome. Parcels which have utilities accessible to them are still not developed because of clouded title problems that are prohibited by mortgage lenders.

6. Water Quality: Discussion of marine water quality in the proposed sale area involves a comparison of reported baseline concentrations against established or putative federal water quality criteria and State of Alaska water quality standards. Both federal and state water quality management do not require an evaluation of marine sediment quality or the bioaccumulation of marine biota as indicators of marine water quality. The State of Alaska Department of Environmental Conservation (DEC) does include a marine sediment standard for total hydrocarbons and aromatic fractions thereof.

Central Bering Sea measurements of cadmium and lead at selected water depths (0-75 meters) were uniformly below 1 part per billion (ppb). Similarly, southern Bering Sea measurements of cadmium, lead, copper, nickle, and chromium in shelf waters at selected depths were uniformly below 1 ppb. These reported concentrations are between 1 and 2 orders of magnitude (10^1 to 10^2) less than the applicable Environmental Protection Act (EPA) water quality critera (Burrel, 1976; Burrel, 1977). Baseline concentrations for the above elements are reported because these are either naturally occurring in crude oil or formation waters or are present in drilling fluid discharges in concentrations greater than the established water quality criteria (Clark, 1978).

OCSEAP investigators have analyzed the sediments of Norton Sound for total carbon, organic carbon, aliphatic, and aromatic hydrocarbons. The findings yield only concentrations of aliphatic hydrocarbons typical of biogenic origin. There is no evidence of fossil- or combustion-derived aromatic hydrocarbons. There is also no evidence of petroleum hydrocarbons in either the water column or the suspended sediments of Norton Sound. A gas seep has been located in central Norton Sound, south of Nome. The seep is primarily composed of thermogenic carbon dioxide with lesser quantities of thermogenic natural gas (OCSEAP, 1980). (Also refer to Section III.A.1.)

No baseline data are available for various synthetic, organic chemicals in the Bering Sea shelf waters which are toxic to pelagic communities and man. Existing concentrations of synthetic, organic constituents in Bering Sea shelf waters are presumed to be low because of the absence of major point and nonpoint sources in western Alaska. Toxic thresholds of these compounds for marine mammals and organisms are in the order of parts per million in concentration, or 10^6 times the sampled levels in the marine environment (National Academy of Sciences, 1973).

Major point source discharges of industrial or sanitary waste in Norton Sound and the Yukon Delta are virtually non-existent since there are neither major sewage treatment facilities nor industrial plants in the proposed sale area. The city of Nome and other villages do have sanitary waste water systems which discharge treated wastes.

Of relevance to baseline water quality conditions in the Norton Sound and Yukon Delta area is the presence of natural sources of contaminant influx. The mineral terrain in local and regional geological units yield significant depositions of trace metals in the Yukon Holocene sediments of Norton Sound and in the relict sedimentary cover of the Chirikov Basin (USGS, 1980). The

rates of sedimentary loading from regional watersheds and the Yukon River drainage are orders of magnitude greater then any single anthropogenic point source of discharge or cumulative loadings anticipated in the proposed lease sale area.

7. Air Quality: Existing air quality in the proposed sale area is considered pristine. The Environmental Protection Agency (EPA) has prepared emissions inventory and ambient air quality estimates for areas in Alaska with relative low populations, based on general emission factor relationships with local economic base and demographic data. Using this method of air quality analysis, the EPA considers Nome and Wade Hampton election districts, which comprise the onshore portion of the proposed sale area, to be in compliance with federal ambient air quality standards (EPA, 1978). It is most likely that the area's air quality is far superior to the national and state standards. However, no air monitoring has been performed in the Norton Sound area.

Under provisions of the Prevention of Significant Deterioration Program (PSD), air quality is protected in regions superior to the National Ambient Air Quality Standards. Alaska is designated as either class I or II under the PSD program. Class I air quality designation is most restrictive and applies to national parks, wilderness areas, monuments, primitive areas, wild and scenic rivers, and wildlife refuges that meet certain specifications. There are no class I PSD designated areas in the vicinity of Norton Sound. Hence, the area is designated class II for the PSD program.

F. BLM Studies Programs

1. Environmental Studies Program: Extensive environmental studies are conducted in each OCS area proposed for gas and oil development before development is allowed. As manager of the Outer Continental Shelf Leasing Program, the Bureau of Land Management (BLM) of the Department of the Interior (DOI) initiated the Outer Continental Shelf Environmental Assessment Program (OCSEAP) as an essential part of its management responsibility. The environmental studies program is conducted under interagency agreement between BLM and OCSEAP of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce (DOC).

In 1974, BLM requested NOAA to initiate an environmental assessment program in the northeastern Gulf of Alaska and eight additional Alaska Outer Continental Shelf areas. A studies program for lease areas and some non-specific study areas in Alaska was planned. This program assembled historical data about the Alaska Outer Continental Shelf and addressed new study needs to provide a basis for assessment of petroleum exploration and development impacts.

Study efforts in Norton Sound began in 1975. The initial studies were broad-scale surveys and produced information defining circulation patterns, sea floor faults, seismic activity, unstable sediment areas, critical habitats, and biological populations. Special studies were intensified in subsequent years to fill data gaps in nearshore processes and to determine possible environmental impacts due to OCS development.

The specific objectives of the Alaska OCS Environmental Assessment Program are described below:

a. Contaminant Distribution: These studies are intended to establish predevelopment hydrocarbon and trace metal concentrations along carefully designed station grids.

A significant part of the contaminant distribution study program was directed towards process-orientated studies. These studies were designed to give insight into processes that control hydrocarbon distributions in the Alaska OCS and to answer questions of seasonal variability of pollutant concentrations in water, biota, and sediments due to biological activity or petroleum exposure.

b. Geologic Hazards: Geologic hazards to petroleum-related activities center around seismicity, surface and near-surface faulting, sediment instability, erosion and deposition, and stratigraphy.

Many hazards present in Alaska lease areas also occur in other U.S. shelf areas. A knowledge of the nature, frequency, and intensity of severe environmental events is essential.

Seismic field studies began in fiscal years 1975 and 1976 to supplement existing studies being funded by other agencies. The Bureau of Land Management is directly supporting part of the seismic program in an ongoing Geological Survey study, employing a land-based network of seismographic stations. All geohazard studies conducted by the University of Alaska have been funded through BLM/OCSEAP. The major objectives of these seismic studies are to determine a probability scale for earthquake hazards and to improve the statistical reliability of the existing data base. This is accomplished through continuation of present observational programs and use of additional or improved instrumentation, such as ocean-bottom seismometers and strong motion accelerometers.

Shelf faulting and sedimentation studies are conducted in order to define potential hazards to minimize or avoid environmental risks by appropriate regulation of facility siting, design, and construction. Certain geologic features, identified as potentially troublesome during regional reconnaissance of the proposed lease area, are studied in further detail. The regional reconnaissance phase requires about a 2-year study effort. Focused studies on special problems take an additional 2 to 3 years. These are time estimates which vary depending on the proposed lease area size, geological complexity, and nature of the identified hazards.

The shelf faulting and sedimentation studies have produced basic information on geologic hazards of the area, including location of probable active faults, potentially unstable sediments, and erosional and depositional areas on the shelf. The work is being continued to gather additional block specific hazards information. Refer to Sec. III.A.1. and IV.A.7. for more detailed discussions about geologic hazards.

c. Pollutant Transport: Transport and transformation (weathering) of petroleum-related contaminants are significant considerations in an assessment of potential impacts of OCS developments. Petroleum and other contaminants introduced into the environment can be transported in the atmosphere, in the water column, and by sea ice. During transport, contaminants undergo continual physiochemical changes such as evaporation, flocculation, emulsification, weathering, biodegradation, and decomposition.

Transport studies are designed to provide information that will enable the Department of the Interior and other agencies to (1) plan stages and siting of offshore petroleum development to minimize potential risks to sensitive environments; (2) provide oilspill trajectories, coastal landfall, and effects of oilspill cleanup operations; and (3) assist in planning the location of long term environmental monitoring sites in the study area.

Long term, direct measurements of coastal winds and currents in Norton Sound have been performed by OCSEAP. Transport studies were designed to proceed from a regional description of oceanographic and meteorological features to analyses of processes. Oceanographic investigations included literature summaries, current measurements, hydrographic station data, remote data sensing, and computer modeling. Meteorologic studies have concentrated on field observations and computer simulation of coastal wind patterns.

The oceanographic studies lead in part to an oilspill trajectory model, which is the basis of the Oilspill Risk Analysis that is described in Section IV.A.4. The oilspill trajectory model that has been prepared for Norton Sound is an excellent, sophisticated model. The model incorporates realistic factors such as subsurface circulation and ice movement.

d. Biological Resources: A major reason for conducting biological population studies in Norton Sound has been to determine which populations, communities, and ecosystems are at risk from oilspills or increased industrial activity in the area. Distribution and abundance estimates, migration patterns, feeding sites, and population behavior are the first studies undertaken. The study results are used to determine potential vulnerability. Should vulnerability be indicated, detailed site specific studies are undertaken. These studies focus on ecosystem processes, trophic and population dynamics, disturbance sensitivity, habitat dependence, and physiological characteristics.

The first few years of biological studies were concerned with the distribution and abundance of key species through reconnaissance surveys. For higher trophic levels, these studies identify critical habitats, migratory routes, and principal sea bird and marine mammal breeding locations.

e. Effects: Effects research is ongoing; it is not designed exclusively for any one lease sale area. The research results are used to establish possible, long term causal relationships between OCS-related perturbations and biological changes, and to form the basis for developing discharge regulations and operating stipulations. Also, the studies program is evaluating biological responses to stresses, in order to determine their potential usefulness as early warning indicators or monitoring aids in detecting and quantifying environmental changes.

Prior to 1979, most effects studies were conducted in the laboratory. However, in fiscal years 1979 and 1980, the emphasis shifted toward field studies. The field studies are designed to validate laboratory observations and to obtain data on exposure concentrations and compositions likely to occur under various environmental conditions.

All of these studies have culminated in two meetings. One symposium was held in Anchorage on November 1979. The meeting was designed to synthesize all

Aside from the environmental information that has been collected by OCSEAP, much information on whales has been collected directly by the Alaska OCS Office as part of the BLM Environmental Studies Program. These whale studies are also listed in Appendix I.

In general, enough environmental information is available on Norton Sound for good assessment of the possible impacts of the proposed OCS lease sale.

2. Socioeconomic Studies Program: The Socioeconomic Studies Program (SESP) of the Alaska OCS Office was created to determine and assess the potential onshore social, economic, and physical impacts from outer continental shelf oil and gas development. As a multi-year, multi-discipline program, the SESP conducts studies on the sociological and anthropological aspects of diverse groups. The SESP focuses on a longitudinal investigation of the development process, beginning from the assembly of predevelopment information to the monitoring of project development as it affects specific communities, regions, or the state as a whole. In addition, the program makes economic analyses of rural and urban communities, regions within the state, and the state as a whole, with assessments of both natural and manmade infrastructures.

The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, nature, and timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, material, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes are also included.

The statewide/regional analysis focuses on the statewide effects of cumulative and incremental lease sales, and the distribution of these effects among certain defined subregions of the state. The local level analysis focuses on the direct effects of a lease sale on affected communities.

The SESP identified the study area for the Bering-Norton petroleum development region to include the census divisions of Nome, Wade Hampton, and Anchorage. The following major study tasks were conducted.

a. Petroleum Development Scenario: Numerous oil and gas options were constructed through a combination of U.S. Geological Survey resource estimates and locational data from independent geologic assessment. A parameter economic analysis was conducted to assess their economic viability. These scenarios were then detailed according to technology; facility, material, and manpower requirements; and scheduling. Four different levels of petroleum development were prepared.

b. Statewide and Regional Population and Economic Forecasts: A non-OCS base case was developed that assumed no new significant oil, gas, or

other mineral development in Alaska beyond current commitments. Forecasts were then prepared for four different potential levels of oil and gas development. Forecasts to the year 2000 were made for population, employment, income, and state government fiscal impacts.

c. Impacts on Socioeconomic and Physical Systems: Community facility standards were developed and applied to the non-OCS base case and each of the oil and gas scenarios. The data included education, public safety, recreation and tourism, utilities, housing, and local government resources, investments, and capital needs.

d. Impacts on Transportation Systems: A methodology was developed and applied to assess impacts of land-, air-, and water-related transportation. The ability to move goods and materials in and out of the region and throughout the state for the non-OCS base case, and for the scenarios, was assessed.

e. Impacts on the Sociocultural System: Issues analyzed were traditional use of all resources, including land, marine, and ice environments; subsistence; cultural values; politics; interethnic relationships; social health; and family relationships.

f. Impacts on Commercial Fishing: Conflicts were anaylzed between the commercial fishing industry and OCS activities. Issues analyzed included the competition for ocean space, labor, and infrastructure.

From September 1976 until early 1980, Peat, Marwick, Mitchell and Co. had the responsibility to hire subcontractors to perform the work required for impact assessment. The following is a list of contractors who have conducted research tasks for the Bering-Norton petroleum development region: Peat, Marwick, Mitchell and Co.; Policy Analysts, Ltd.; Institute of Social and Economic Research; Dames and Moore; Linda Ellanna; U.S. Coast Guard; Pacific Northwest Forest and Range Experiment Station of the U.S. Department of Agriculture, Forest Service; and the University of Alaska Museum.

IV.

ENVIRONMENTAL CONSEQUENCES

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A. Basic Assumptions for Impact Assessment

Under the terms of the proposed action, 429 blocks for a total of 988,416 hectares (2.4 million acres) would be leased for oil and gas exploration and development. For the block deletion alternatives, the lease areas are as follows: Alternative IV, 709,632 hectares (1,753,500 acres); Alternative V, 571,392 hectares (1,411,910 acres); and Alternative VI, 626,688 hectares (1,548,546 acres). USGS estimates that undiscovered recoverable resources resulting from the mean case of the proposed action are 480 MMbbls of oil and 2.01 tcf of natural gas. (Also refer to Section II.A.)

Efforts have been made within this section to quantify impacts which could result from the proposed lease sale. The mean case was used to quantify probable levels of developmental activity. Therefore, it should be kept in mind that all figures are relative to the mean case. (Refer to Appendix F for a summary of minimum and maximum impacts.) There are, however, many areas in which quantification of impacts is difficult, due to lack of data and variable factors that affect any potential development.

Impacts described within this document are written with all pertinent laws of the United States, including USGS Operating Orders for the OCS, in effect, and would shape and mitigate certain impacts. Further, the discussion of cumulative effects contained in each impact section is based on the interrelationship of this proposed action as well as other major, current, and proposed projects. Section IV.A.8. contains a discussion of projects considered in preparation of the cumulative effects assessments.

Because of the many assumptions involved, the analysis is not intended, nor should it be used as a "local planning document" by potentially affected communities. Neither is it a forecast or prediction of the future. All facility locations and scenarios described in this document are intended to represent a few plausible locations and scenarios that presently seem likely. They serve only as a basis for identifying characteristic activities and resulting impacts for this EIS and do not represent a BLM recommendation, preference, or endorsement of facility sites or development schemes.

1. Activities Associated with Exploration: It is assumed that 45 exploration and delineation wells may be drilled in Norton Sound as a result of this proposed sale. Substantial exploratory drilling activity would take place during the initial 5 years (leases are presently issued for 5-year periods as set forth in 43 CFR 3302.2) with a maximum of five exploratory rigs working at any one time. The vessels for drilling exploratory wells would probably arrive from a variety of regions (most likely offshore Canada, Gulf of Mexico, and the North Sea). Three types of rigs--jack-ups, drillships, and artificial islands, are hypothesized for use in the sale area. Jack-ups would be the preferred type of platform. The possible use of artificial islands would be in the more shallow depths surrounding the Yukon Delta. Exploratory drilling, unless conducted from artificial islands, is expected to occur only during ice-free periods (mid-May to mid-October), when ice would not pose a hazard to drilling operations.

Because of the shallow, nearshore bathymetry of Norton Sound, it is believed that marine support and supply efforts for each drill platform or vessel would come from barge/warehouses anchored near a drill site. These floating warehouses would contain the materials necessary to maintain operations (i.e., fuel, water, cement, mud, tubular goods) and would be periodically replenished by supply barges and ships from outside the proposed sale area and from shallow draft, self-propelled barges from the city of Nome.

Air support would probably come from the Nome airport. Perishable goods and personnel would be ferried via helicopter from a small, 2-hectare (5-acre) complex located near the airport.

Peak employment during the 5-year exploratory phase is expected to occur in 1985 when about 29,000 work months (approximately 2,400 employees) would be expended on exploratory activities. For a more detailed description of the basic infrastructure assumptions and the employment involved, refer to Alaska OCS Technical Paper No. 1, Resources, Developmental Time Frames, Infrastructure Assumptions, and Block Deletion Alternatives for Proposed Federal Lease Sales in the Bering Sea and Norton Sound.

2. Activities Associated with Development: If oil and gas are discovered as a result of this proposed sale, fixed platforms may be installed offshore. Technology presently exists to install platforms in all water depths which would be encountered as a result of this proposed lease sale.

It is assumed that all production platforms would be constructed outside of Alaska, either at existing U.S. west coast or Japanese shipyards. The platforms would then be floated or transported via barges to a drill site.

Once platforms are installed, one or two drillings rigs would be placed on each platform to drill production wells. For purposes of this analysis, it is estimated that as a result of this proposal, there may be 172 development wells drilled from 9 platforms.

The development period of proposed lease sale 57 is expected to occur between 1985 and 1991. (Please note that in this case there is no clear time distinction between the exploratory, development, and production periods. In reality, the winding down of one activity or period would extend into the time frame of another.) It is during the development phase that drilling and construction activities would reach their greatest intensity. Within this 5-year time frame, exploratory drilling would be terminated (1987), the bulk of developmental drilling would occur, all trunk pipelines would be in place, and the oil terminals and gas compressor station, as well as all necessary industrial infrastructure, would be constructed.

The development period would probably include improvement of the Nome-Cape Nome Road, expansion of the small support base at Nome to a facility 10-12 hectares (25-30 acres) that would be capable of handling the daily logistical requirements for offshore drilling operations, and the construction at Nome of a pier large enough to dock standard draft support vessels. (This does not include the area required for a possible pipe coating yard.) The city of Nome has requested a permit from the Corps of Engineers to construct a 1,115-meter (3,400 ft) rubble mound causeway to a docking facility at the 9.8-meter (30-ft) depth contour.

Several types of production platforms could be used in the proposed sale 57 area. In water depths less than about 20 meters (65 ft), large ice-resistant artificial islands could be constructed of gravel, sand, mine tailings, or similar rubble materials. These islands would be larger than the man-made islands used as platforms for exploratory well drilling in the Alaskan and Canadian Beaufort Sea. The islands would also have a higher freeboard than the Beaufort Sea islands because of the larger waves and higher tides in Norton Sound. In the Canadian Beaufort Sea, a cassion-retained island is presently being constructed in 23 meters (75 ft) of water. The design of these islands includes measures to protect against erosion and ice override.

Because of the water depths in the proposed sale area, cylindrical or conical pile-founded structures could possibly be used as production platforms. A pile-founded structure of the cylindrical design is presently being used as a production platform in Cook Inlet. This platform stands in about 19 meters (62 ft) of water and was designed for a 9-meter (30 ft) tidal range. To be used in the proposed sale area, a monopod platform of the Cook Inlet type would have to be designed to withstand the wave, wind, and ice forces of Norton Sound.

A gravity type of monopod production platform, which is still in the development stage, consists of a hull with ballast tanks for raising and lowering and work platforms that are supported by a structural column rising from the center of the hull. A cone attached to the column causes the ice to fail in flexure. Another type of gravity structure which is being considered for use in Norton Sound consists of production facilities that are supported by a large concrete base. This base serves as a hull while the structure is towed to the production site. In place, the base is flooded so that it comes to rest on the seafloor.

Recovered hydrocarbons would be processed on a platform and pumped to shore via an 18-inch oil and a 14-inch gas pipeline. The pipelines would equal some 299 kilometers (186 mi) for each pipe system. The placement and burial of the pipelines could disturb up to 3,600 cubic meters (4,680 yd^3) of earth per kilometer.

Surveys and previous investigations would be used to determine the safest route for laying submarine pipelines and the forces which must be considered in the design of the system. Also, the pipeline would have to be buried deep enough to avoid damage by the forces which cause current scouring or ice gouging.

The pipelines would terminate in a storage and processing facility of approximately 36 hectares (90 acres) located near Cape Nome. This facility would consist of a gas liquefaction facility capable of processing between 175-200 MMcf per day (with a peak capacity of about 400 MMcf per day), and a crude oil storage facility capable of handling an average flow of 62,622 Mbbls per day. (Maximum peak daily flow in 1990 would be 273,972 bbls.) Additional area would be necessary for living quarters for the construction crews that would be housed near the terminal complex.

Peak employment forecast for the developmental period is expected to occur in 1988 with about 40,000 work months (approximately 3,300 employees) of labor expended for mining, construction, and support activities. The analysis in this EIS assumes an enclave type housing development at Cape Nome (see Appendix B).

Secondary to the onshore developmental feature scenario would be an offshore loading scenario. This scenario would include a production system wherein hydrocarbons would be pumped to central processing platforms or artificial islands on which the crude oil would be stored and the natural gas liquefied. Attached to the facility would be an ice-resistant loading dock to which ice-breaking oil and liquid natural gas tankers (LNG) could safely moor.

Finland is presently using ice-breaking tankers in the Gulf of Bothnia. These tankers are designed for operation in 1-meter-thick level ice and 10-meter-thick ridges. These vessels are constructed with ice-breaking hulls, double bottoms, and features to reduce ice resistance along the hull. The design of tankers for use in Norton Sound would use this technology to build the type of vessel which could operate safely in the area on a year-round basis.

The employment requirements of the offshore scenario would equal about 25,000 work months of labor at the maximum stage of development. This would be substantially lower than that projected for the onshore scenario.

Application of the offshore scenario to the proposal is somewhat limited, especially given the estimated resources. It is believed, however, that an offshore scenario would be most appropriate for Alternative V. Because of the low oil-resource estimates for Alternative V, it is believed that it would not be economically capable of supporting an extensive onshore infrastructure. With regard to Alternatives IV and VI, it is felt that their infrastructure development would closely parallel that of the primary onshore scenario.

For a more detailed discussion of the developmental infrastructure of the proposal, as well as each of the block deletion alternatives, refer to Alaska OCS Technical Paper No. 1.

3. Activities Associated with Production: During the production period, employment should decline sharply from that of the developmental phase, both onshore and offshore. No major construction activities are projected for the developmental phase for this proposed sale. Although subsea completions may be in place to develop marginal fields, employment during this phase is expected to be limited to production, transportation, mining, and maintenance activities. Average production phase employment is expected to be about 11,000 work months of labor.

Norton Sound hydrocarbons are expected to be transported by ice-breaking oil and LNG tankers. Due to the shallow depths in Norton Sound, these vessels might be about 125,000 m^3 and 100,000 DWT, respectively. These tankers could ferry the product to a transshipment terminal located along the Aleutian Chain and the Alaska Peninsula.

a. Estimated Resources and Activities Based on the Minimum-Case of the Proposed Action: Oil and gas resources of the proposed action for the minimum case are forecast at 90 MMbbls of oil and 90 bcf for natural gas. Peak output is expected to occur in 1989 with the production of 22 MMbbls of oil and 22 bcf of natural gas. Production of resources may begin by 1988 with oil and gas reserves exhausted some 23 years after the sale date (2005).

According to the USGS, exploration activities should begin by 1983 and continue through 1987. In the exploratory period, it is estimated that 10 wells would

be drilled from 4 rigs. Exploratory workforce requirements should peak in 1984 with the expenditure of 3,400 work months (approximately 280 employees) of labor. Exploratory support activities projected for the minimum case are expected to be the same as those of the proposal. Air support would originate from the Nome airport, while marine support for drilling activities would be staged from warehouse barges anchored near the drilling vessels. (For further information, see Sec. II.A.)

Because of the low amount of resources forecast for this case, the developmental scenario of the minimum case would be more basic than the scenario hypothesized for the mean case of the proposal. A scenario for the minimum case could feature the offshore processing and loading of extracted hydrocarbons at the production platforms, which would eliminate both the need for an extensive pipeline network and any requirement for an onshore processing and loading terminal. However, if the produced hydrocarbons are brought to shore, Cape Nome would be a possible site for the pipeline landfall and terminal location. Produced gas would probably be reinjected into the formation. The estimated quantities of natural gas forecast for the minimum case are far too low for viable economic recovery.

Platform types that could be used in the exploratory and developmental/production phases of this case are not expected to differ from those considered in the mean case of the proposed action.

b. Estimated Resources and Activities Based on the Maximum-Case of the Proposed Action: Oil and gas resources for the maximum case of the proposed action are forecast at 1.52 Bbbls of oil and 5.04 tcf of natural gas. Peak output of oil is expected to occur in 1993 with the production of 202 MMbbls of crude. Maximum yield of natural gas should occur in 1994 with the extraction of 369 bcf. Production of resources may begin by 1988, with oil reserves depleted 30 years after the sale date (2012) and gas reserves exhausted 41 years after the sale date (2023).

Exploration activities could begin by 1983 and continue through 1987. In the exploratory period, it is estimated that 50 wells would be drilled from 18 rigs (separate drilling vessels). No more than five rigs would be expected to be working in any one year. Exploratory workforce requirements would peak in 1985 with the expenditure of 31,400 work months of labor. Exploratory support activities projected for the maximum case are expected to be the same as those of the proposal. Air support would originate from the Nome airport, while marine support for drilling activities would be staged from warehouse barges anchored near the drilling vessels. (For further information, see Sec. II.A.)

Developmental and construction activities are projected to begin in 1986 with the installation of two (the first of 27) production platforms. Development and construction activities should continue until 1993. Within that time, some 586 development wells could be drilled and 186 miles of pipeline laid. Employment during the developmental phase would be expected to peak in 1989 with the expenditure of about 67,000 work months (approximately 5,600 employees) of labor.

Produced hydrocarbons would be transported to shore via a 36-inch oil pipeline and a 44-inch gas pipeline. The pipelines could terminate in a large crude oil storage and gas liquefaction complex located near Cape Nome.

Production platforms used in all phases of this case are not expected to differ from those considered in the mean case of the proposed action.

Employment requirements for the production phase of this case would be expected to remain constant at about 27,500 work months per year.

4. Oilspill Risk Analysis:

a. Estimated Quantity of Resource: Considerable uncertainty exists in estimating the volume of oil that would be discovered and produced as a result of an OCS lease sale. The estimated oil resources used for the oilspill risk calculations correspond to those estimates in this environmental impact statement (Sec. II.A.). There is, however, an important qualification in the way these estimates are used in this document. The resource estimates used in predicting the number of spills expected over the life of the field and in the oilspill risk analysis for this environmental impact statement are based on the unrisked mean estimates which assume the resource would be discovered. For the proposed sale area, the likelihood of finding commercial quantities of oil is 14 percent. Obviously, if oil is not discovered (an 86-percent probability), there would be no oilspill risks. The predicted number of spills and, accordingly, the results of the oilspill risk analysis, reflect the expected oilspill risk based on the mean resource estimate.

b. Probability of Oilspills Occurring: The probability of oilspill occurrence is based on the fundamental assumption that realistic estimates and future spill frequencies can be based on past OCS experience. This analysis assumes that spills occur independently of each other and that the spill rate depends on the volume of oil produced or transported. This last assumption--spill rate is a function of the volume of oil handled--might be modified on the basis of size, extent, frequency, or duration of the handling. In the case of tanker transport, for example, the number of port calls and the number of tanker years have been considered (Stewart, 1976; Stewart and Kennedy, 1978). This analysis uses volume of oil handled, since all other estimates must ultimately be derived from this quantity.

This analysis examines spills in two size ranges (where data permits): 10,000 barrels or greater and 1,000 barrels or greater (which includes the first category). To place these sizes in a rough perspective to the type of accident usually involved, spills in the largest category are usually associated with catastrophies such as large blowouts or shipwrecks. Accidents in the second category typically include these and other serious events, such as structural failures and collisions. The choice of which size range to use depends upon the analysis being performed. If, for example, a particular impact could occur only from a massive oil slick, then only large spills should be examined.

Accident rates for platforms on the U.S. OCS were derived from USGS accident files (USGS, 1979), and from USGS production records (USGS, 1980). For spills of 1,000 barrels or larger, a period from 1964-1979 was used. Between 1964-1979, there were four spills, 10,000 barrels or larger, and nine spills (including the 4) 1,000 barrels or larger. During this period, U.S. OCS oil production was 4,386 million barrels.

USGS accident files are also a major source of data for pipeline accidents. As with platforms, the period from 1964-1979 was used for spills of 1,000 barrels

or larger. USGS files (1979) include two spills over 10,000 barrels and seven spills (including the two) over 1,000 barrels. Devanney and Stewart (1976) report six additional pipeline spills; all except one of 1,020 barrels occurred in coastal channels. Adding this one spill to the USGS data gives a total of eight spills, 1,000 barrels or larger. Since nearly all of the U.S. OCS production has been transported to shore by pipelines, the same production statistics used for platforms can be applied to the pipeline accident rate.

Tanker accident rates were derived from published literature. The tanker accident rate for spills of 1,000 barrels or larger, used in recent oilspill risk analysis models, is from Stewart (1976): 178 spills in 45,941 million barrels transported. There is, unfortunately, no detailed listing of these spills in the published literature. However, Devanney and Stewart (1974), examining tanker spills on major trade routes, reported 99 spills greater than 42,000 gallons (1,000 barrels), 87 spills greater than 100,000 gallons, and 32 spills greater than 1 million gallons. Interpolation of this data gives about 53 spills greater than 10,000 barrels, or about 54 percent of the 1000-barrel spill rate. This estimate can be partially confirmed by listings of spills in oilspill intelligence reports (1979-1980) where, out of 22 spills of crude oil from carriers reported from 1978 and 1979 known or estimated to be larger than 1000 barrels, 15 or 68 percent were larger than 10,000 barrels. Therefore, a ratio of 60 percent of the 1000-barrel rate appears reasonable, giving an estimated spill rate for 10,000 barrels and larger spills of 107 per 45,941 million barrels.

In summary, the spill rates used in this document are:

Spills Per Billion Barrels

	Greater than 1,000 bbl	Greater than 10,000 bbl
Platforms	2.05	0.91
Pipelines	1.82	0.46
Tankers	3.87	2.32

Spill frequency estimates were calculated for production and transportation of oil from proposed sale 57. Table IV.A.4.b.-1, based on the above spill rates, shows the statistically expected number of spills that could occur during the expected production life of the proposed lease area. The number of spills was calculated for both the risked mean estimates, which assumes only a 14-percent chance of finding commercial quantities of oil, and the unrisked mean estimate, which assumes the estimated mean resource would be found. For spills greater than 10,000 barrels, a maximum of 0.94, or about one spill, could be expected, based on the risked mean estimate. For spills of the same magnitude, using the unrisked mean estimate, a maximum of 1.50, or about two spills, could be expected over the life of the field. The numbers of oilspills estimated for the proposed action and Alternative VI are the same since the oil resource estimate is the same. It should be noted that spills of 1,000 barrels or greater would be expected to occur about twice as frequently as the larger spills of 10,000 barrels and greater (Table IV.A.4.b.-1).

c. Oilspill Trajectories Simulations: Oilspill trajectories were simulated by the Rand Corporation in Santa Monica, California, using

Table IV.A.4.b.-1
Oilspill Probability Estimates for Spills
Greater than 1,000 and 10,000 Barrels
Resulting from Proposed OCS Lease Sale 57

	Mean (BBls)	Expected Approximate Number of Spills Based on Unrisked Mean Estimate[1] 1,000[3]	10,000	Probability of One or more Spills Based on Risked Mean Estimates[2] 1,000	10,000
Proposed Action (Onshore and Offshore Scenarios)	480	2.80	1.50	0.94	0.70
Northern Deletion (Onshore and Offshore Scenarios)	260	1.50	0.82	0.78	0.48
Southern Deletion (Onshore and Offshore Scenarios)	480	2.80	1.50	0.94	0.70
Eastern Deletion (Onshore and Offshore Scenarios)	90	0.56	0.23	0.43	0.22

[1] Unrisked mean estimate assumes the mean resource estimate would be discovered and produced.

[2] Risked mean estimate includes risk factor (14% probability) of finding the mean resource estimate.

[3] Also includes oilspills of 10,000 barrels and greater.

Sources: Alaska OCS Office and USGS Oilspill Risk Analysis (1981).

Rand's three-dimensional model for estuaries and coastal seas (Liu and Leendertse, 1979; Leendertse and Liv, 1981). Twenty launch points were selected as being representative of platform locations, pipelines, and tanker routes in the proposed lease area (Fig. IV.A.4.c.-1). In this analysis, the location of the center of mass for each hypothetical oilspill was reported every 12 hours. Oilspill trajectories were simulated under three sets of environmental conditions. The first set, which included the months of December to May, was termed an ice-covered condition. During this period, Norton Sound is covered by ice floes. For each launch point, 10 oilspills were simulated under different weather scenarios. The second set of trajectories was simulated during an ice-free condition, from June to August. Because of the variability of the weather during this period, 20 hypothetical spills were launched from each site. The third set of trajectories was also simulated during an ice-free condition from September to December. During this period, 10 hypothetical oilspills were again launched from each site. The trajectories for these three seasonal conditions were calculated by Rand Corporation and transmitted to the USGS, Reston, Virginia, on compatible computer tapes. To determine the environmental risk factors, these trajectories were then applied to land segments and targets provided by the BLM (Samuels and Lanfear, 1981).

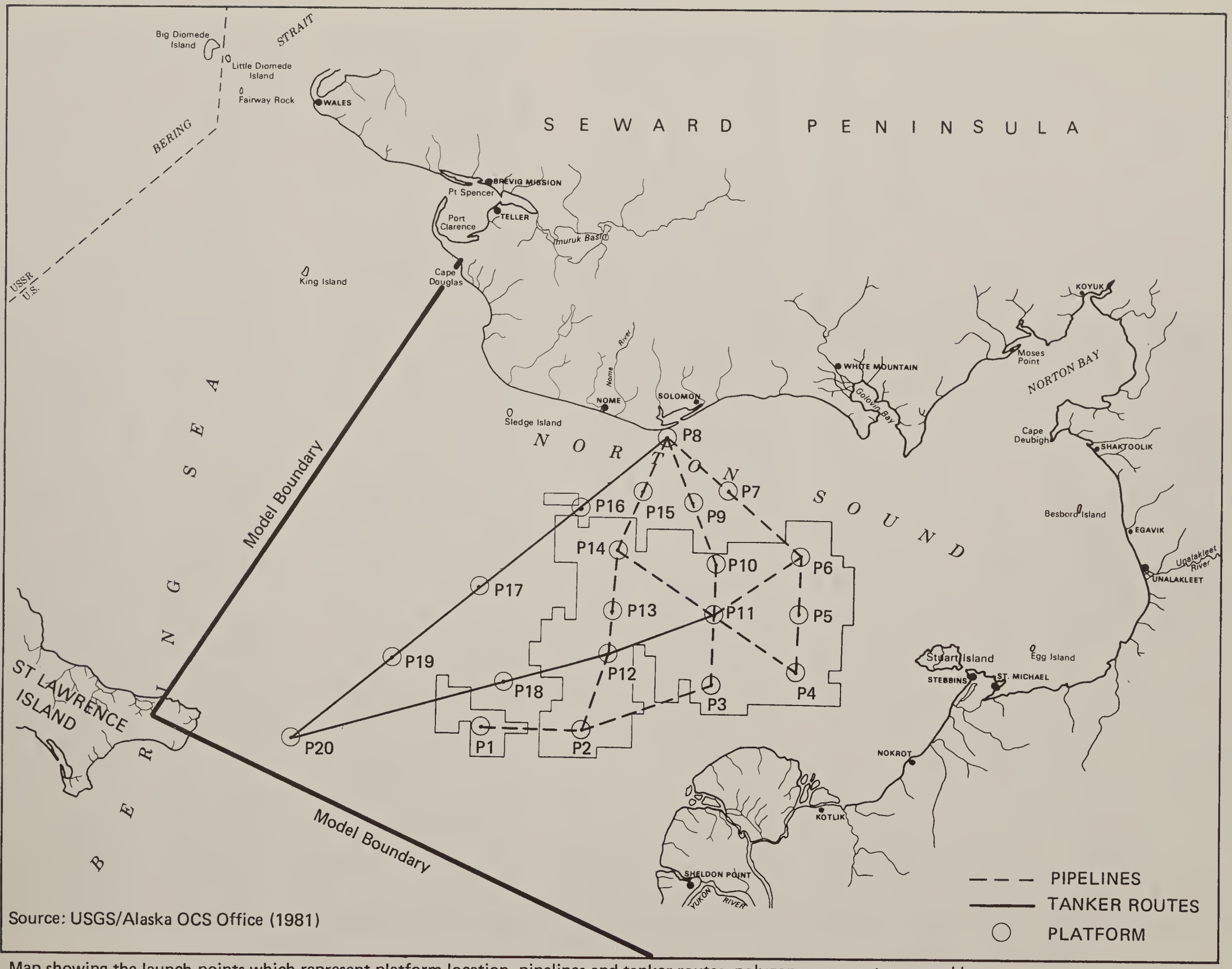
It should be emphasized that the trajectories simulated by the model represent only hypothetical pathways of oil slicks and do not involve any direct consideration of cleanup, dispersion, or weathering processes which could determine the quantity or quality of oil that might eventually come in contact with targets. An implicit analysis of weathering and decay can be considered by knowing the age of simulated oilspills when they contact targets. For this analysis, three time periods were selected: 3 days--to represent diminished toxicity of the spill, 10 days--to allow for the deployment of cleanup equipment, and 30 days--to represent the difficulty of tracking or locating spills after this time.

Results of the trajectory simulations are presented in terms of conditional and final probabilities. The probability of an oilspill contacting either land segments or targets from the given launch points (Fig. IV.A.4.c.-1) are termed conditional probabilities. These probabilities do not include the likelihood of a spill occurring or, in other words, do not include the expected spill rate. They assume only that a spill has occurred from the respective launch points and represent the percentage chance of contacting specific land segments and targets (Appendix J, Tables 1-6). These probabilities are useful in identifying those areas that pose the highest risk to specific targets and land segments.

The conditional probabilities were combined in the analysis with the expected spill rates based on the unrisked mean resource estimates to yield the overall probabilities. The overall probabilities for the proposed sale and each alternative are shown for biological targets in Appendix J, Tables 7 to 14, and for land segment targets in Appendix J, Tables 15 to 22.

The overall probabilities that a spill would occur and contact land for the proposal and each of the alternatives are shown in Table IV.A.4.c.-1. When considering the onshore and offshore transportation scenarios, the overall probabilities did not differ more than 5 percent. The probability of land segments being contacted within a 3-day transport time for onshore and offshore scenarios for the proposal and each alternative is very low (less than 3

Figure IV.A.4.c.-1



Source: USGS/Alaska OCS Office (1981)

Map showing the launch points which represent platform location, pipelines and tanker routes; polygons represent proposed lease tracts.

Table IV.A.4.c.-1
Overall Probabilities (% Chance) of an Oilspill
Contacting Land within 3, 10, and 30 Days
Over the 25-Year Oil Production Life of the Field[1]

	3 Days		10 Days		30 Days	
	1,000 BBls	10,000 BBls	1,000 BBls	10,000 BBls	1,000 BBls	10,000 BBls
Proposal[2] Onshore	2	1	27	12	51	26
Proposal[2] Offshore	N	N	22	9	53	27
Alternative IV (Northern) Onshore	1	N	15	6	32	15
Alternative IV (Northern) Offshore	N	N	12	5	34	16
Alternative V (Eastern) Onshore	N	N	5	2	11	5
Alternative V (Eastern) Offshore	N	N	3	1	12	5
Alternative VI (Southern)[2] Onshore	2	1	27	12	51	26
Alternative VI (Southern)[2] Offshore	N	N	22	9	53	27

N=Less than 0.5 percent.

1 Based on unrisked estimate which assumes the mean resource estimates for the proposed action and each alternative will be discovered and produced.

2 The number of spills estimated for the proposed action and Alternative VI (southern deletion) are the same since the resource estimate is the same.

Sources: Alaska OCS Office and USGS Oilspill Risk Analysis (1981).

percent). For spills of 1,000 barrels and larger, the percent of land segments contacted after 10-day transport simulations for the proposal would be about 27 percent. Alternative IV (northern deletion) would pose a 15-percent chance of an oilspill contacting land segments, or a 44-percent reduction in the potential impacts of the proposal. Alternative V (eastern deletion) would pose a 5-percent chance of oilspills contacting land segments. This would reduce the potential impacts of the proposal about 84-percent.

Using the overall probabilities, a relative risk scale was applied to further evaluate the proposal and each alternative. Land segments which had a greater than 20-percent chance of being contacted by an oilspill were ranked as high-potential risk areas. Land segments which had an 11- to 20-percent probability of contact were designated as moderate-potential risk areas. Those areas with less than 11-percent probability of contact were designated areas of low-potential risk. These orders of potential risks, used previously in the EIS for proposed OCS sale 60, are somewhat arbitrarily selected to provide a reasonable basis on which impacts from oilspills can be analyzed.

For the proposal and each alternative, none of the land segments within Norton Sound exceeded a low-potential risk. The major potential impact zones are the northern coastal regions of Norton Sound along land segments 19, 21, 22, and 23 (Fig. IV.A.4.c.-2). This is due primarily to the proximity of the transportation routes with respect to the developmental scenarios.

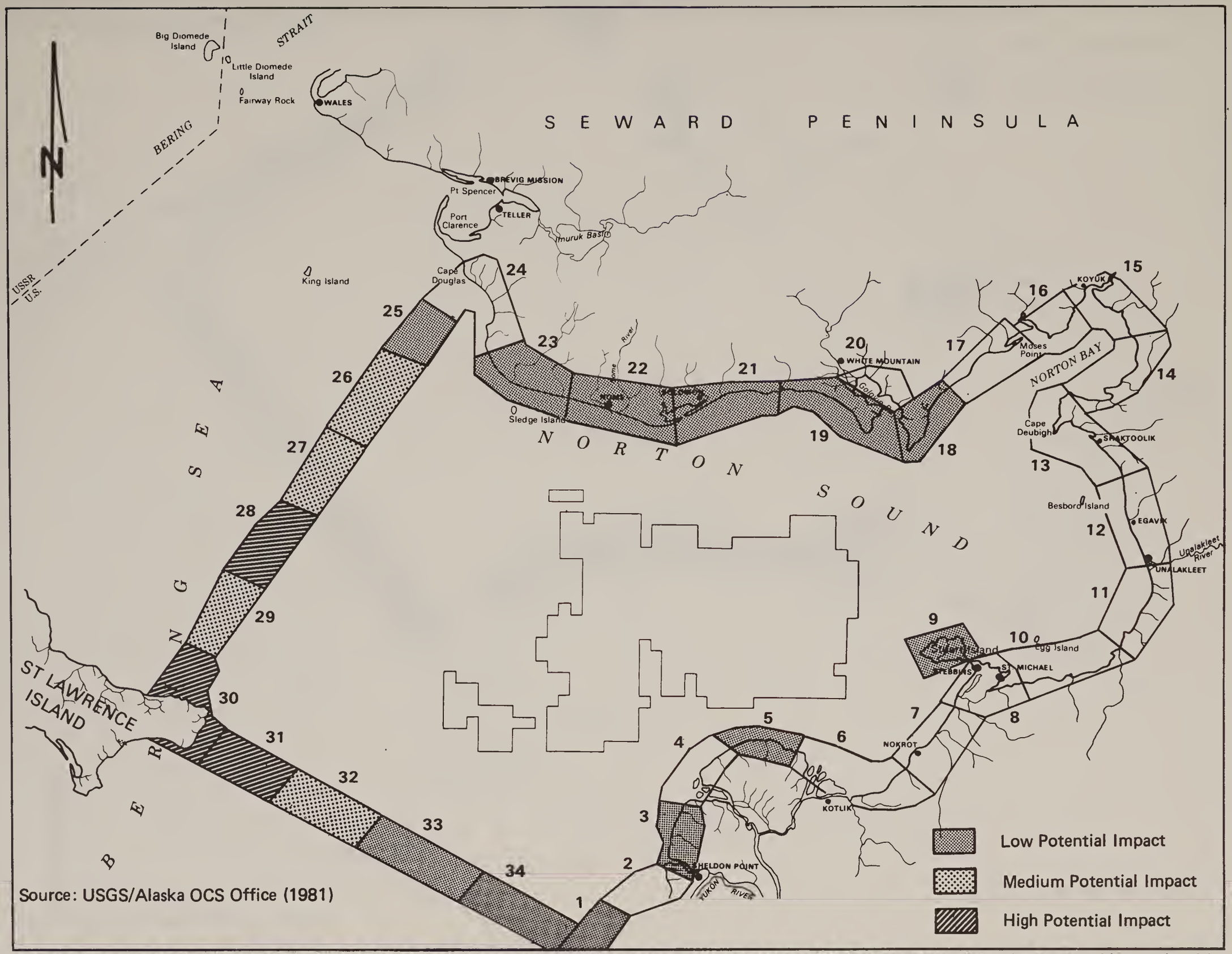
Alternative IV (northern deletion) does not significantly reduce potential impacts to the coastal segments within Norton Sound from those presented by the proposed action (Fig. IV.A.4.c.-3). This alternative would reduce land segments 18 and 5 from a low- to no-potential risk. However, the eastern coast of St. Lawrence Island (segment 30) would be reduced from a high- to a moderate-potential risk.

Alternative V (eastern deletion) would reduce potential risks to primarily the northern coast of Norton Sound, St. Lawrence Island; and, to some extent, the Yukon Delta and Stuart Island (Fig. IV.A.4.c.-4). Along the northern coastal region, land segments 18, 19, and 21 would be reduced from a low-risk potential to no potential risk. The eastern coast of St. Lawrence Island (segment 30) would be reduced from a high- to a low-potential risk. Land segments 3 and 5, comprising part of the Yukon Delta and Stuart Island (segment 9), would be reduced from low- to no-potential risk. Some additional reductions in potential risks would be expected along the eastern coastal regions; however, this is primarily of a very low-potential risk even with the proposed action.

Alternative VI (southern deletion) presents the same potential risks as the proposed action (Fig. IV.A.4.c.-2), since the resource estimates are the same. However, if oil were discovered in the southernmost blocks, the greatest potential risk would be to the Yukon Delta region.

In summary, the proposal represents only a low-potential risk to Norton Sound but a relatively high-potential risk to the eastern coast of St. Lawrence Island. Alternative IV (northern deletion) and Alternative V (eastern deletion) reduce the risk somewhat to Norton Sound, but most significantly to St. Lawrence Island. Since these deletion alternatives represent 46-percent (Alternative IV) and 81-percent (Alternative V) reductions in the potential resource, respectively, it may be appropriate to have a comprehensive con-

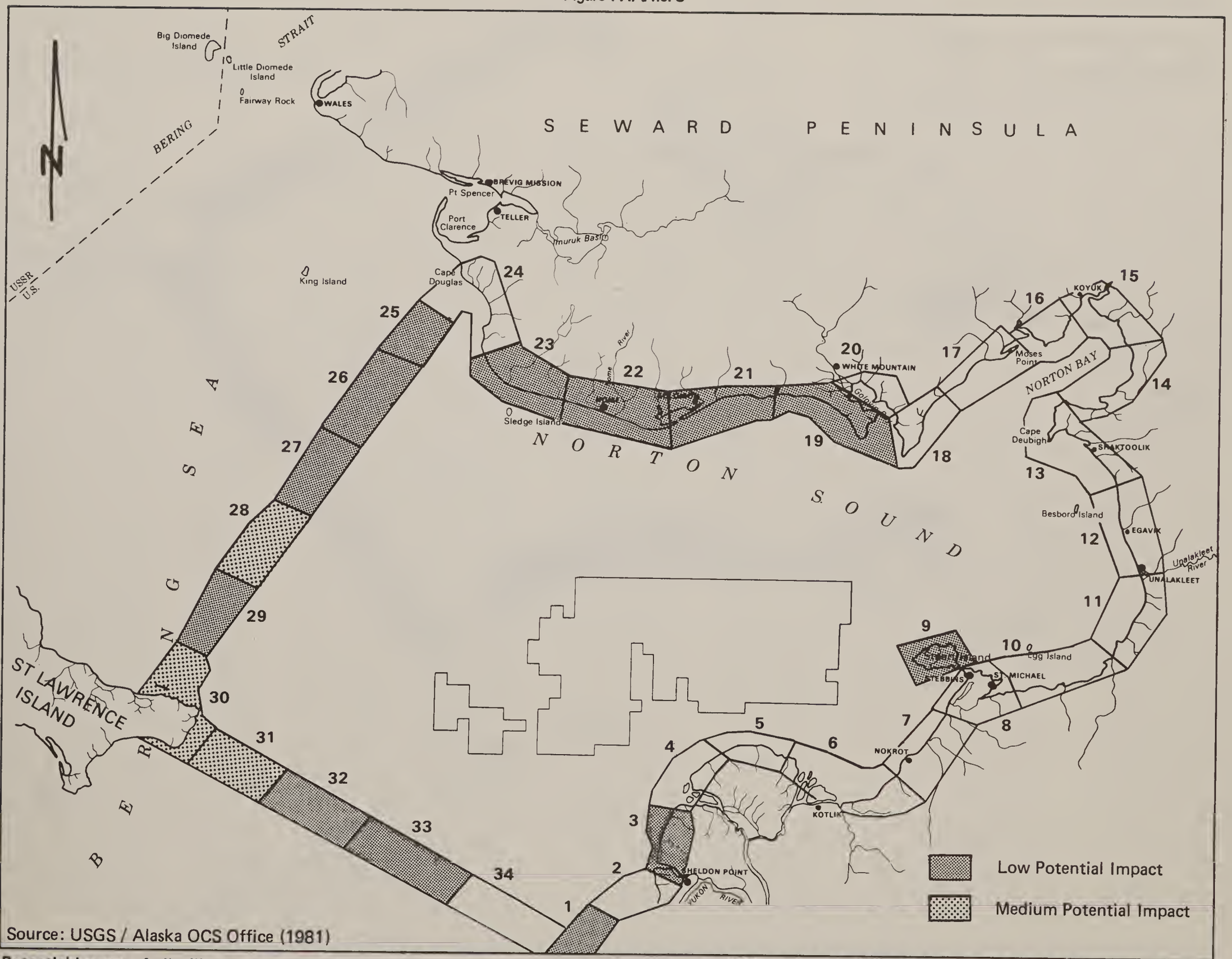
Figure IV.A.4.c.-2



Source: USGS/Alaska OCS Office (1981)

Potential impact of oilspills greater than 1000 barrels to land segments based on the overall probabilities (10-day trajectories) for the proposed lease sale with onshore transportation.

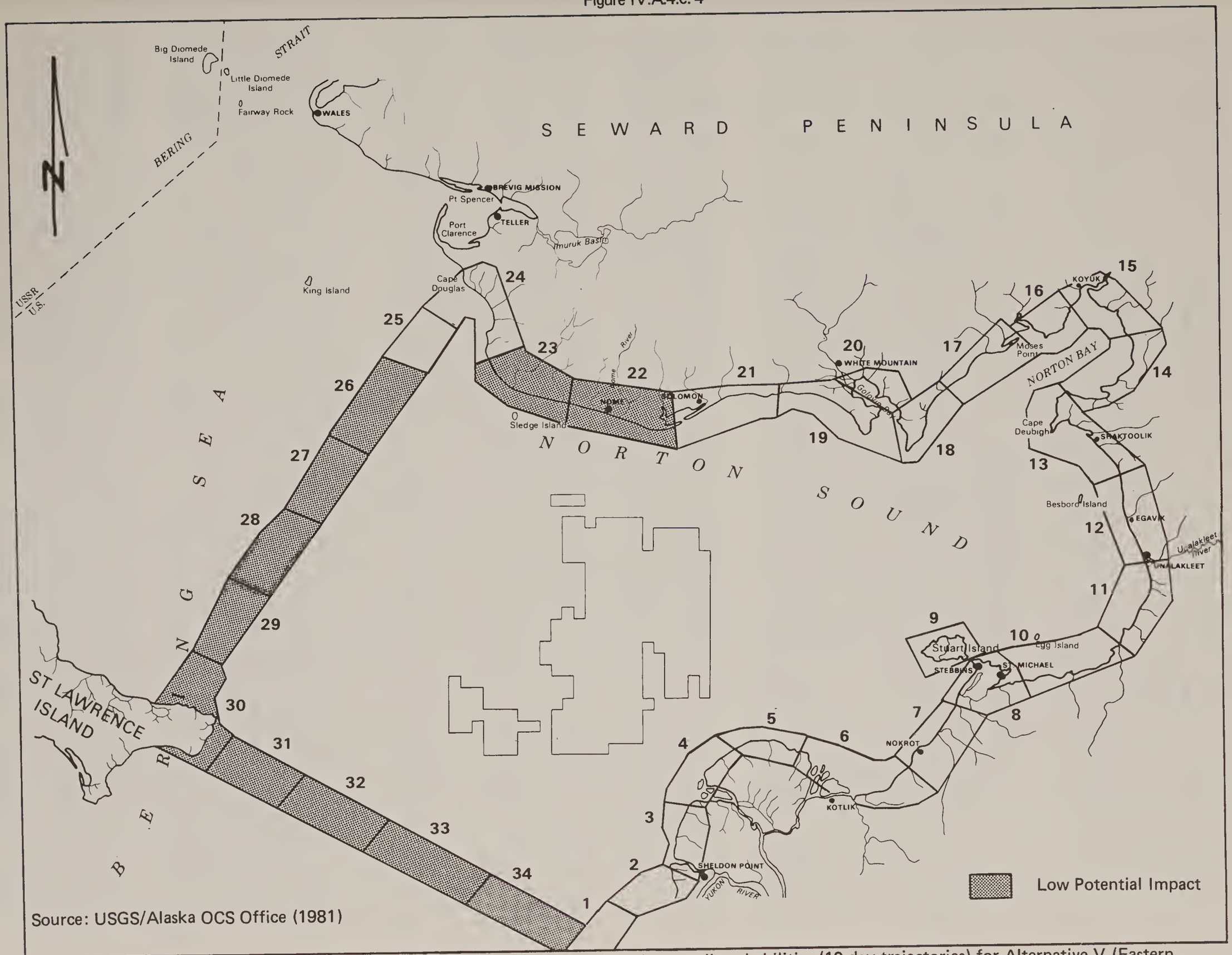
Figure IV.A.4.c.-3



Source: USGS / Alaska OCS Office (1981)

Potential impact of oilspills greater than 1000 barrels to land segments based on overall probabilities (10-day trajectories) for Alternative IV (Northern Deletion) with onshore transportation.

Figure IV.A.4.c.-4



Source: USGS/Alaska OCS Office (1981)

Potential impact of oilspills greater than 1000 barrels to land segments based on the overall probabilities (10-day trajectories) for Alternative V (Eastern Deletion) with offshore transportation.

tingency plan for St. Lawrence Island which would significantly reduce the potential risk of the proposed action. Also, in keeping with USGS resource estimates, this analysis has assumed no oil resource potential within the southern blocks of the proposal (southern deletion). The location of commercial quantities of oil in the southern deletion blocks would pose significant potential impacts to the Yukon Delta. Therefore, this alternative significantly reduces the potential for oil-related impacts to the Yukon Delta region.

5. Oilspill Contingency Measures: The basic philosophy of the oil and gas industry in dealing with oilspills is to prevent them before they happen. Considerable attention is given to preventive measures such as better technology and better training. Since, however (as with many systems), there is a chance of human error or equipment failure, it is necessary to consider the secondary measures that would be taken if an oilspill did occur.

At the request of the Alaska OCS Office, a task force of industry personnel from the Alaska Oil and Gas Association (AOGA) and the Alaska Beaufort Sea Oilspill Response Body (ABSORB) prepared a document which describes several possible worst case oilspill scenarios for the Norton Sound proposed OCS sale area (refer to Appendix K).

Each scenario includes a description of a spill, the spill movement and behavior, and industry's response to the spill. In addition, each scenario takes into consideration the time and duration of the spill, the amount of discharge, the areal extent, weather conditions, and the state-of-the-art for containment and cleanup technology.

One scenario deals with a high-volume, short-term blowout that is sprayed into the atmosphere and onto the water surface during the late, open-water season. It discusses open-water containment and recovery techniques during average weather conditions and shoreline cleanup procedures for possible impacted shoreline areas of the Yukon Delta during storm conditions.

The other scenario is a production-phase situation where a large volume of oil is spilled under the ice from a ruptured submarine pipeline. The proposed response techniques discussed are stated to be the result of current research and field tests being conducted by industry.

Other scenarios and methods of containment and cleanup could be applied to the different situations that could develop. These main scenarios give us an idea how industry would approach the oilspill contingency plan that is required before any exploration plan is approved. Such a plan would have to take into consideration a larger number of scenarios, possible alternatives to the methods of containment and cleanup discussed in this document, and any improvements in containment and cleanup techniques that could develop before the plan is submitted.

6. Oilspill Response: Federal response capabilities and responsibilities in the event of an oil pollution incident are prescribed by the National Oil and Hazardous Substances Pollution Contingency Plan, published March 19, 1980, by the Council on Environmental Quality. Since Federal contingency planning in Alaska has been done in accordance with earlier National Plans, information used here from Alaska regional planning documents is subject

to revision, which is presently underway. Wherever possible, changes expected to be made in regional contingency plans to reflect the new National Plan will be cited.

The National Plan provides the framework for a geographically integrated Federal response capability, and encourages the participation of state and local governments in coordinated preparedness and action. The National Response Team serves as the model for regional response organizations, makes special forces and equipment available to regional organizations, and serves in an oversight capacity to evaluate and recommend improvements for response capabilities nationally.

In Alaska, the entire coastal area is a geographic zone of responsibility covered by the Alaska Coastal Region Multi-Agency Oil and Hazardous Substances Pollution Contingency Plan. The plan specifies responsibilities among Federal and state government agencies, and designates the primary responsibility for effecting a coordinated response to pollution incidents in the marine environment with the United States Coast Guard. In Alaska, as elsewhere in the nation, primary responsibilities for coastal and inland waters are divided between the Coast Guard and the Environmental Protection Agency (EPA), with the EPA assuming primary responsibility in those geographic areas upstream of tidal influence.

The Alaska Coastal Region Plan specifies governmental response to a pollution incident as primarily a function of the Regional Response Team (RRT), the On Scene Coordinator and the Scientific Support Coordinator. The RRT is composed of Federal and state agency representatives and is chaired jointly by the Coast Guard and EPA. The RRT is responsible for planning and preparedness actions prior to a pollution discharge and for coordination and advice during a pollution emergency. In addition to the Coast Guard, members of the Alaska Coastal RRT are designated representatives from the State of Alaska, the EPA, the Federal Emergency Management Agency, and the following Federal departments: Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, Justice, Labor, and State. Representatives of local governments may be designated to participate in the activities of the RRT. And, as at the national level, the Coast Guard additionally maintains and operates the Regional Response Center, which in Alaska, is located at the District Headquarters in Juneau.

Alaska coastal waters are divided into geographic zones of responsibility for which an On Scene Coordinator (OSC) is predesignated by the Coast Guard. The designated OSC for the lease sale area is the Commanding Officer, Marine Safety Office, Anchorage. The function of the OSC is to develop and maintain a federal local contingency plan for federal response in the area of the OSC's responsibility; and, at the scene of a discharge, to serve as the single point of contact for advising the spiller on cleanup measures or, if necessary, to coordinate and direct the federal response and expedite pollutant removal efforts. The OSC provides information to and receives advice from the Regional Response Team (RRT) during a spill emergency. The Scientific Support Coordinator (SSC), provided by the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, is on the staff of the OSC at the scene of a spill to provide scientific advice and mediate advice from the scientific community on the scene.

The following is available to assist the RRT, OSC, and SSC in performing their duties: national special forces on call such as the Pacific Strike Team of the Coast Guard and the Environmental Response Team established by the EPA; a computerized national inventory of pollution response and support equipment for locating specialized equipment tailored to the characteristics of the spill; memoranda of agreement and interagency agreements to explicitly define areas of responsibility in cases where ambiguity may exist; and specialized functional groups within the RRT to provide expertise and leadership in areas such as public information, pollution-control techniques, damage assessment, and protection of living marine resources.

a. Petroleum Industry Oilspill Response Organization: An oilspill response organization is expected to be organized by the petroleum industry prior to exploration in the proposed lease sale area, as has been the case elsewhere in Alaska. The existing petroleum industry response organizations include the Cook Inlet Response Organization, the Gulf of Alaska Cleanup Organization, and the Alaska Beaufort Sea Oilspill Response Body. These response organizations are made up of a number of petroleum industry companies and operate through voluntary private industry agreement to jointly acquire oilspill containment and cleanup equipment, train personnel in its deployment and use, and provide a pooled capability of response greater than any individual company could provide.

b. Petroleum Industry Oilspill Contingency Planning: The petroleum industry oilspill response organization in the proposed lease sale area can be expected to produce and continue to maintain an oilspill contingency plan, which is a compilation of information needed by on-site response personnel. Such information generally includes inventories and operating characteristics of equipment resources; lists of supplies and distributors of containment and cleanup services and supplies; procedures for containment, cleanup, and disposal; the names and telephone numbers of specific individuals in key government and business organizations; and organizational policy and operating agreements with other firms.

Additionally, the industry response organization in the proposed sale area is expected to belong to the Alaska Cooperative Oilspill Response Planning Committee (ACORP), an informal organization formed in 1977 that includes the Alaska Department of Environmental Conservation, the United States Coast Guard, and the petroleum industry in Alaska. The ACORP Pollution Response Plan is intended to provide the means to coordinate federal, state, and petroleum industry resources in response to a significant oil pollution incident in coastal waters of Alaska. The plan provides for the sharing of resources, including equipment and technical expertise, among public and private spill response organizations and specifies procedural and fiscal terms and conditions for such sharing. Besides facilitating cooperative oilspill response, the plan allows the responsible party in a spill incident to gain access to state, federal, and industry oilspill and logistics equipment, technology, and personnel.

c. Oilspill Preparedness by OCS Lessees: The revised outer continental shelf orders governing oil and gas lease operations (Federal Register, December 21, 1979) specify requirements of OCS lessees for oilspill preparedness. OCS Order No. 2 (drilling operations) requires the lessee to submit with the Exploration Plan or Development and Production Plan to the

Deputy Conservation Manager (DCM), USGS, evidence of the fitness of the drilling unit to perform the planned drilling operation. Such evidence must also include information on pollution prevention equipment associated with the drilling operation. Based on past experience, minimum equipment and supplies for initial containment are based at the drilling site, usually including an inflatable containment boom, a mechanical oil skimming device, a storage container for cleaned up oil, sorbent pads, surface collecting and dispersant chemicals as well as chemical applicators. Generally, the operational capabilities of the containment booms found on board (based on manufacture type) function in waves up to 5 to 6 feet and in winds of up to 20 to 25 knots. Oil skimming equipment of the type generally on board operates in waves up to 2 to 3 feet in height, whereas sorbent booms and pads are used only with contained spills. The best of the skimmers available will only work in 8-feet-or-less seas and at wind speeds less than 20 knots. Wind and wave conditions would prohibit use of even this skimmer 50 percent of the time in winter and 10 percent of the time in summer.

OCS Order No. 7 prescribes measures required of each lessee for pollution prevention and control. Included are requirements for inspections and reports, pollution control equipment and materials, oilspill contingency plans, and annual drills and training of personnel. Each lessee is required to submit an oilspill contingency plan to the DCM for approval with, or prior to, an Exploration Plan or a Development and Production Plan. Required in the contingency plans is information on response equipment and deployment times, response capability for varying spill severity, the means for identifying and protecting areas of special biological sensitivity, procedures for notifying key personnel, and provisions for response action at the scene of a spill. Pollution control equipment and materials must be maintained by, or available to, each lessee at an offshore location, or at a location approved by the DCM. Availability of such equipment and materials is required prior to the commencement of drilling and production operations. For example, in the case of OCS sale 39 exploratory drilling off Yakutat, pollution-control equipment and materials were located in Yakutat and Seward, as well as on the drilling vessel itself.

d. Cleanup Policies and Techniques: According to the Alaska Coastal Region Plan, the primary consideration in any spill response is the protection of life and property, followed by protection of the natural environment. Endangered and threatened species identified by federal law are also specifically addressed in the new National Plan. Where total removal of the pollutant from the environment is not possible, action to protect critical areas and remove pollutants therefrom takes priority.

Mechanical methods and sorbents are preferred in Alaskan waters for control of the source of discharge as well as the containment and removal of the pollutant. The use of chemical agents is governed by the National Plan and the circumstances of the spill. Generally, approval for use of chemical agents must be obtained from the senior EPA representative on scene at the spill on a case-by-case basis, after consultation with other appropriate state and federal representatives. Exceptions to this general rule are for the use of surface collecting agents in accordance with the National Plan listing of approved chemicals where the use of chemicals would reduce the immediate hazards to human life due to explosion and fire.

e. Oilspill Incident Response: The Federal Water Pollution Control Act requires that all harmful discharges of oil and all discharges of hazardous substances into the navigable waters of the United States must be reported immediately to the appropriate federal authority. The designated authority in Alaskan coastal waters is the United States Coast Guard. The Coast Guard can be contacted as follows:

(1) Calling the toll free number ZENITH 5555.
(2) Calling the designated OSC for the area in question. In the case of the proposed lease sale area, the OSC is Captain R. H. Spoltman, 907-271-5137.
(3) Calling any Coast Guard unit in the vicinity of the incident.
(4) Calling the Commander, 17th Coast Guard District in Juneau, 907-586-7195.

The OSC has the responsibility to respond to all reports of spill incidents. Oilspills in coastal waters are classified according to the National Contingency Plan by the amount or potential amount of discharge, as follows:

Minor discharge:	less than 10,000 gallons.
Medium discharge:	10,000 to 100,000 gallons.
Major discharge:	more than 100,000 gallons.

The report of the existence or potential of a major spill, even an unconfirmed report, requires the OSC to immediately notify the National and Regional Response Centers. A minor spill normally will not require the OSC to alert the full membership of the RRT, but the decision to do so is based on the judgment of the OSC after investigating the spill report. Alerting the membership of the RRT usually is carried out by telephone conference call and normally is cause for activating the full or partial membership of the team to the scene of discharge.

Federal regulations mandate those responsible for a spill to take appropriate abatement and cleanup actions. When the responsible spiller takes appropriate actions, the OSC will observe and monitor progress and provide advice and counsel to the spiller. Federal cleanup activities are instituted when the spiller is unknown or when, in the judgment of the OSC, the spiller does not act promptly, does not initiate appropriate cleanup action, or is unable to take adequate cleanup measures.

If an alleged spiller can be identified and cleanup is required, the OSC must immediately notify the owner, operator, or appropriate responsible party, in writing, of federal interest, liability for cleanup, and other aspects of the Federal Water Pollution Control Act or National Contingency Plan, as appropriate. If the alleged spiller fails to initiate cleanup activities or initiates improper or inadequate cleanup actions, the OSC must advise the spiller in writing that his actions are considered inadequate and that he is liable for cleanup costs incurred in the event of a federal cleanup. Such notice failing, the spill incident becomes a federal responsibility.

7. Constraints on OCS Oil and Gas Activities: Section III.A.1. (Environmental Geology and Ice Hazards) described potential hazards to OCS facilities without mitigation. Design engineering for OCS facilities, and the environmental protection provided by federal, state, and local laws and

regulations, would provide such mitigation. In particular, the OCS Lands Act, as amended; BLM's oil and gas lease stipulations; the OCS Operating Orders of the USGS; U.S. Coast Guard Regulations; EPA's discharge and pollution regulations, the Fisherman's Compensation Fund, and other Federal regulations, provide a considerable degree of environmental protection by controlling OCS operations. A description of federal regulations appropriate to the OCS is provided in Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities. In addition, the oil and gas industry polices itself by adherence to design and operational guidelines for oil and gas activities as set forth by the American Petroleum Institute.

Table III.A.1.-1 (Sec. III.A.1.) indicates the degree of potential hazards in terms of time in which technology would be available to mitigate hazards by engineering design, construction, and compliance with federal, state, and local regulations. The table also shows the extent to which additional data would be required to permit the orderly design and construction of OCS facilities.

A detailed explanation of the table can be found in the draft report of the OCSEAP Norton Sound Synthesis Meeting (Appendix D). The report describes the hazards listed in the matrix and the impact on the various facilities and activities and attempts to assess the status of technologies available to cope with the respective hazards. The final report for the synthesis meeting is in press and will be released by the Alaska field office of NOAA/OCSEAP in 1981 under the name of George Keller. Examination of Table III.A.1.-1 will show that the constraint of ice forces on the engineering design of an offshore loading terminal in Norton Sound is the only category for which technology would not be specifically available in the first 5 years, or approximately at the time of the proposed lease sale. For the remainder of physical constraints discussed in this section, technology would be available in the first 5 years, or at the time of the proposed sale. The following is a list of the constraint-facility combinations for which technology would be available in the first 5 years, or at the time of the proposed sale.

a. Ice Forces: There would be a moderate hazard for gravity platforms. Design criteria would have to consider ice thickness, flow velocity, and ridge keel strength. Also, ice thickness and floe velocity would place a moderate- to high-hazard impact on tankers.

b. Faults: The effect that the presence of faults would have on the development of petroleum resources in Norton Sound is uncertain because information regarding the ages of the displacements and the rate of movement along the fault surfaces is, for the most part, unknown (Sec. III.A.1.B of this EIS). The faults which are exposed at the surface in the form of scarps indicate that displacement has occurred recently, but the exact timing and rate is not known. Active faults are, of course, a high-potential hazard to any structure which might be placed over or near them. Sudden movement along a fault surface could initiate sediment slumping or liquification.

c. Thermogenic Gas: A zone of highly charged gas sediments has been identified in a zone over 9 kilometers in diameter south of Nome. These sediments are located at depths greater than those affected by biogenic gas and also possess much greater pressures. For this reason, they are considered a very high hazard to any drilling program. Penetration into such a

zone could result in a blowout and explosion. However, thermogenic gas charging is a localized problem that can be avoided when its presence is defined.

d. Current Scour: Nelson (1980) has shown that storm-related current scours can occur up to 2 meters in depth. A single storm surge can scour up to half a meter of sediments. Since this type of action generally occurs around and from beneath objects, it was considered by participants of the Norton Sound Synthesis Meeting to be a potentially high hazard to pipelines.

e. Biogenic Gas: These sediments display a lower shear strength than deposits without gas. Therefore, they present potential foundation problems for many offshore facilities. Due to the stress induced by unequal bearing strength of gas-charged and normal sediments, the hazard level is high for gravity platforms and sea terminals and moderate for jack-up rigs, gravel islands, and pipelines. In addition, blowouts of gas from shallow depths are documented, and any drilling program should take this hazard into consideration.

f. Liquefaction: Due to a loss of sediment cohesion by a variety of causes, a liquefying of material could occur down to depths of 10 meters below the sea floor. Such a loss of strength creates a moderate hazard to bottom-mounted facilities such as gravity platforms and offshore terminals. In the case of pipelines, this loss of support would be rated as a high hazard.

In view of the lead time required prior to the actual production and transportation of oil and gas (about 6-8 years), the technology required to cope with the above physical constraints would probably be available in advance of the construction and installation of facilities such as production platforms, onshore facilities, and pipelines. These facilities would be about 4 to 8 years ahead of potential production and transportation. This is especially noteworthy in view of federal requirements for developmental, pipeline, and onshore terminal environmental impact statements, in addition to the federal, state, and local governmental agency reviews and permits required prior to any actual construction activities or the production of oil and gas. By the time production and transportation facilities would be required, both the technology and the information needed for site-specific design would be available in compliance with all federal, state, and local regulations. Environmental information, especially from BLM's environmental studies program, would be accumulating and available. In addition, a significant amount of proprietory data gathered by the petroleum industry would become available to meet permit requirements. Some of this data (e.g., waves, wind, and ice) is related to the design of facilities.

In view of the long lead time required to develop site-specific OCS construction, production, and transportation facilities, the physical constraints for which technology is presently unavailable would not remain as constraints in 5 to 10 years.

However, at the time of the proposed Norton Sound lease sale, it is still unlikely that offshore loading terminal technology would have been designed, engineered, tested, and made operational to function without risk due to the

presence of ice forces in Norton Sound. In this context, offshore loading would probably not occur from an artificial island.

Conclusion: The effect of sea ice on an offshore loading terminal (not an artificial sediment island) is the only physical constraint on offshore OCS facilities for which proven technology would not be available at the time of the proposed Norton Sound lease sale.

If any oil and gas discoveries are made and confirmed when the post-sale exploration phase is completed, both the engineering design and environmental information necessary for site-specific design of an offshore loading terminal would be available.

Effect of Additional Mitigating Measures: When industry is ready for a production and transportation phase of OCS activities to begin, there would be no physical constraints on offshore OCS facilities in Norton Sound which could not be mitigated by site-specific engineering design in compliance with the appropriate federal environmental regulations as well as federal, state, and local permits and leases.

Cumulative Effects: If the physical constraints can be overcome in the manner that Table III.A.1.-1 implies and appropriate technology can be constructed, installed, and operated in compliance with appropriate federal, state, and local regulations for the first sale area in Norton Sound, then there are no other physical constraints which could create any cumulative constraints for subsequent oil and gas sales and offshore activities in Norton Sound. In fact, subsequent sales and development would have all the additional benefit of cumulative knowledge, experience, technology, and environmental information collected throughout the developmental process from the first sale.

Unavoidable Adverse Effects: There would be no unavoidable adverse effects of physical constraints on OCS offshore activities and facilities, because the design, environmental information, and technology to work with the physical constraints described in Section III.A.1. would be available and in compliance with appropriate federal, state, and local permits and regulations at the time of the proposed lease sale and, later, at the time of production and transportation of potential oil and gas resources.

8. Major Projects Considered in Cumulative Impact Assessment:

a. Guidance on Cumulative Impact Assessment: The regulations for implementing the procedural provisions of NEPA require that the EIS consider cumulative impacts "on the environment which results from the incremental impact of the (proposed) action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

There are two fundamental issues in cumulative impact assessment: identifying other actions which may contribute to significant cumulative impacts and identifying methods for measuring and evaluating cumulative impacts in this EIS. This section addresses primarily the first issue. The second issue is discussed under each assessment. The two issues are interrelated in that a determination must be made whether another action or project is sufficiently

defined and its impacts understood so that a meaningful cumulative effects assessment can be completed.

Specific factors for determining whether future actions should be the subject of cumulative impact assessments include the following: (a) whether the proposal includes a submittal and completed application for a license, permit, or other regulatory approval; (b) whether the proposal has been determined to be a "project which may significantly affect the environment" under NEPA; (c) whether the proposal is sufficiently defined in terms of construction and operational characteristics to derive potential impacts in the absence of any formal NEPA review; (d) whether the proposal's geographic area of influence is contiguous to or overlapping with the region that is the subject of environmental assessment in this proposal; (e) whether there is a substantial commitment to execute the proposal; and (f) whether the timing of the proposal's authorization and implementation allows for cumulative impact assessment to be performed within a subsequent EIS required with or expected to accompany the proposal.

The CEQ definition of cumulative impact recognizes past, present, and reasonably foreseeable future actions. Past and present, or ongoing, actions are identified and evaluated in Section III of this EIS (Description of the Affected Environment). However, some past and present actions may not have caused environmental impacts as of this date. Therefore, EIS authors have considered future impacts attributable to these past and present actions as part of their cumulative impact sections within their assessments. Frequently, the cumulative effects assessment cannot differentiate the incremental effect of each action (past, present, and future), due to uncertain conditions and methodological difficulties. In these circumstances, the EIS assumes that the aggregate impact across all types of actions constitutes the cumulative impact.

Where there is a substantial commitment to carry out the project, even though impacts can only be generically identified and project characteristics are merely presumed, future actions are assumed to be reasonably foreseeable for cumulative effects assessment in this EIS. Where subsequent and more discrete environmental assessment of such future actions is likely, then the cumulative effects assessment in this EIS can be considered an initial evaluation of the actions. However, if the commitment to execute the project or action is not assured; if the project is sufficiently removed in time, e.g., 5 to 10 years; or if project definition and impact specification are presently conjectural, then the future action need not be considered for cumulative effects assessment in this EIS.

The phased or sequential consideration of environmental impacts on future actions is permitted under CEQ regulations implementing NEPA (40 CFR 1508.28). CEQ recognizes the "tiering" of environmental impact assessment when project development involves more than one stage over the life of the project and where individual projects constitute implementation of a broader proposal, either in terms of program organization or region of consideration. The CEQ tiering procedure is applied in this EIS to yield phased documentation of cumulative effects assessment where either of the above criteria applies.

b. Review of Future Actions for Cumulative Effects Assessment:

Lost River Mining Project: The Lost River project proposes to mine a fluorite-tin-tungsten deposit located on the Seward Peninsula. The deposit has been identified by different mineralization studies and has been the subject of extensive field exploration and metallurgic process studies. The Canadian Lost River Mining Corporation, Ltd., sponsored a 24-volume feasibility report (Watts, Griffith, and McQuat, Ltd., 1973) which culminated in an application for a Corps of Engineers dredge and fill permit in 1974. The Corps of Engineers issued a Final EIS on the project in 1976 and subsequently authorized a Clean Water Act Section 404 permit to the applicant (COE, 1976).

The established reserves, together with metallurgical and marketing considerations existing in 1975, are sufficient to justify the mining and processing of 1,750,000 tons of ore per year for at least 16 years. The proposed processing facilities have been designed for expansion of the mining operation to a capacity of 2,800,000 tons per year. The shipment of fluorite briquettes by bulk ore carriers was designed for arctic class carriers (Lloyds Ice Class I) with a cargo capacity of 35,000 tons (Germane and Milne,1973). Thus, carrier vessel traffic at the initial annual production rate would be 50 trips per year, while the expanded annual production rate would generate approximately 80 trips per year.

Since the proposal is located in an unsettled part of the Seward Peninsula, the project developer has proposed large investments in infrastructure. These include a mine complex, a new community (serving a population of 1000 people), a marine terminal, an airport, and a surface transportation system. A minimum period of 3 years has been estimated for construction of these facilities. By the end of the third year of construction, the mine complex would be operational.

The world market in fluorite changed, subsequent to feasibility studies prepared in 1971-1973. The Canadian developer, Lost River Mining Corporation, Ltd., was not able to obtain further financial backing for the project. Additionally, contract provisions between the Canadian corporation and the Bering Straits Native Corporation must be resolved. Parties familiar with the project indicate that once major financing is obtained and legal matters are resolved, the project will proceed (personal communication, Ron Sheardown, agent for Lost River Alaska Corporation).

In context with the above guidance, the Lost River project is included in the cumulative impact assessment in this EIS. The project includes an approved permit from a federal regulatory agency, a certified FEIS prepared under NEPA, and a 24-volume feasibility study. A major issue to satisfactory project definition is estimating the timing of its implementation.

Port of Nome Deepwater Terminal: The city of Nome is proposing to build a deepwater port/causeway to support its maritime commerce and the general economic base of the Norton Sound region. The marine terminal is intended to accommodate a 30-foot design vessel draft, oceangoing barges, commercial fishing vessels, tugboats, and petroleum industry workboats. The port/causeway would be sited at the west end of the city limits, on an elevated plateau that is bordered on the north and the east by the Snake River. The port will consist of a 3,600-foot causeway with berthing and loading facilities at its seaward end and with container, general cargo, and bulk handling facilities located onshore. The city expects the port to be operational by the end of

1983. Environmental considerations of the proposed port plan include littoral transport of sand, ice movement and forces, salmon spawning in the Snake River drainage, king crab habitat in the nearshore waters of Norton Sound, and interference with fish migration. Socioeconomic considerations include possible impacts on subsistence fishing due to greater commercial fishing operations and future expansion of the port facility to accommodate hard-rock mineral extraction operations in Norton Sound, as well as the interior of the state.

The U.S. Army Corps of Engineers is the lead permitting agency on the project. The city of Nome has applied for a Section 404 Dredge and Fill Permit from the Corps. The COE intends to prepare an Environmental Assessment Review on the project pursuant to NEPA.

In context with the above guidance, the Port of Nome deepwater terminal is included in the cumulative impact assessment in this EIS. The project includes an application for a federal permit; a feasibility study has been prepared; and a determination has been made by the lead federal agency that an Environmental Assessment Review will be prepared pursuant to NEPA. Project implementation is relatively assured with capital costs being committed by the State Department of Transportation and Public Facilities in its proposed FY 82-83 budget.

Oil and Gas Leasing on Calista Corporation Lands: Calista Corporation is a regional corporation established under provisions of the Alaska Native Claims Settlement Act. The regional corporation is entitled to 2,183,620 hectares (5,405,000 acres) of subsurface estate interest in lands under ANCSA (Arnold, 1976). The Calista Corporation has entered into an exploratory agreement with AMOCO Production Company for a period of 10 years (1978-1988). Refer to Graphic No. 8 for mapping of Native corporation lands located within the Norton Sound and Yukon Delta area that are subject to the exploration agreement. During this period, AMOCO has an exclusive right to explore for oil and gas on Calista's lands. Presently, AMOCO has undertaken a program of seismic surveying and geophysical evaluation. If AMOCO decides to undertake exploratory drilling for hydrocarbons, a separate lease agreement with Calista must be established and recorded.

AMOCO is currently sponsoring engineering studies on siting requirements, suitable drilling platforms, and the logistics of downhole operations in the predominantly wetland and low-tundra environment of the Calista region. AMOCO is considering a winter drilling season and construction of ice airstrips for drilling in the wetlands of the Yukon Delta. No forward base of support operations in established Native villages or Bethel are currently contemplated by AMOCO. No development or production plan, or scenario, has been devised for potential commercial discoveries of hydrocarbons on Calista Corporation lands. Under terms of its agreement, AMOCO must obtain consent from and confer with affected villages in the vicinity of its exploratory/geophysical operations. Additionally, AMOCO obtains consent from appropriate village corporation officials when surface access is necessary for exploration work.

A representative of AMOCO indicates there is a good probability that exploratory drilling will occur on Calista Corporation lands. However, an earlier exploratory agreement between Shell Oil Company and the Calista Corporation did not result in any downhole drilling operations (personal communication,

Mr. Bill Vallee, Alaska Map Service; Mr. Jim Savier, AMOCO Production Company, March 1981).

In context with the above guidance, the Calista Corporation exploratory agreement with AMOCO Production Company is included in the cumulative impact assessment in this EIS. The agreement constitutes a firm commitment, though the project specifications are presumed and the impacts ensuing from the action can only be identified in generic terms at this time. Impacts from surface entry and geophysical operations are ongoing and definable for incorporation in this EIS. Downhole drilling and subsequent hydrocarbon production operations can be postulated for Calista Corporation lands on the Yukon Delta where the possibility of cumulative impacts for this proposal are greatest.

It is noted that the lessee, AMOCO Production Company, must record separately any oil and gas exploration leases on Calista Corporation lands. When known, the location of exploratory operations, support logistics, and the type of drilling platforms can be incorporated in any post-OCS sale 57 exploration and production plan as well as environmental assessment. Thus cumulative effects assessment of this future action is suitable for "tiering" allowed under the CEQ regulations.

State of Alaska Oil and Gas Proposed Lease Sale 38: The State of Alaska has an approved 5-year schedule for oil and gas leasing which includes sale 38, Norton Basin. The sale is scheduled to occur in the first quarter of 1983. The proposed sale area has yet to be defined. The state issued a Call for Nominations and Comments in January 1981 (State Department of Minerals and Energy Management, 1981). The proposed call area comprises the lands submerged under territorial waters of the State of Alaska from approximately the Sinuk River, west of Nome, to the Yukon Delta. (See Fig. I.B.-1 under Leasing History.)

The State Department of Minerals and Energy Management expects to announce tracts selected for further study in the fall of 1981. The state is also expected to prepare a Socioeconomic and Environmental Review on the leasing proposal. However, this will not be available until 1982. No information is presently available regarding resource estimates and exploration and development scenarios for the state's proposed sale. The state has indicated that its offshore lease sale scheduling is coordinated with OCS sale scheduling so as to assist potential operators in hydrocarbon exploration and development (Alaska Department of Natural Resources, 1981; personal communication, Ms. Pam Rogers, Alaska Department of Minerals and Energy Management, March 1981).

In context with the above guidance, the State of Alaska proposed lease sale 38 is included in the cumulative impact assessment in this EIS. The proposed sale constitutes a firm commitment by the State of Alaska in a legislatively approved leasing schedule. However, the specifications, timing, and location of post-sale operations can only be presumed; and the impacts ensuing from the action can only be identified in generic terms at this time. Nonetheless, cumulative effects assessment of oilspills occurring in territorial waters, and post-sale drilling operations and support logistics, can be meaningfully incorporated in this EIS because of the proximity of the proposed OCS blocks to territorial waters in Norton Sound and the Yukon Delta.

It is noted that the additional information will be available for inclusion in the cumulative effects assessment on the state proposal. The selection of tracts in territorial waters for further study in September 1980 will aid in geographically fixing the cumulative risk and environmental damages of an oilspill originating from either federal or state post-sale leasing operations. More discrete cumulative impact assessment of the state's future action can be completed in post-OCS sale 57 exploration and production plan environmental assessments. Hence, cumulative effects assessment of this future action is suitable for "tiering" allowed under the CEQ regulations.

Bornite Prospect: The Bornite Prospect is a multi-mineral deposit that contains the following metals, copper, lead, zinc, silver, and gold. It is located about 250 miles inland from Norton Sound in the foothils of the Brooks Range. These mountains trend east-west across the northern part of Alaska and contain many other mineral deposits of the strategic, industrial, and precious metals. Some of these deposits are part of such mining prospects as Picnic Creek to the east of Bornite, Dead Creek, nearby Arctic Camp, and Lik and Red Dog to the west. Since Bornite is, however, more developed than the other mining prospects, it is the only operation in the Brooks Range that is considered with regard to Cumulative Impact Assessment. Bear Creek Mining Company, a subsidary of Kennecott Corporation, is the holder of the mineral patents at Bornite.

The Bear Creek Mining Company is proposing to extract 500,000 to 1 million tons of ore per year. The major issue confronting the proposal is access to, and export from, the ore body in a transportation corridor which will not damage national interest land units created under the Alaska National Interest Lands Conservation Act. Access to Norton Sound involves crossing the Selawik or Koyakuk National Wildlife Refuges, while access to Kotzebue Sound involves crossing the Selawik Refuge or the Kobuk National Park Reserve, all created under the act. The mining company is presently studying the feasibility of access corridors. Additionally, the Western Alaska and Arctic Transportation Study is evaluating transportation corridors for extraction of minerals in the Brooks Rangs (WAATS, 1981).

The Bear Creek Mining Company has expressed interest in the Port of Nome deepwater terminal as a bulk loading facility for deep draft, 50,000 DWT ore carriers. The port plan includes possible extensions of the causeway to handle deeper draft vessels. Alternatively, the mining company is considering other locations in Norton Sound (Golovin Bay), as well as Kotzebue Sound.

The bornite project has not been subject to any major permit application for commercial operations, nor has any environmental assessment been performed pursuant to NEPA. The Bear Creek Mining Company officials estimate that the project is a least 10 years away from commercial operations (personal communication, Mr. Jay Hammit, Geologist, Bear Creek Mining Company, March 1981).

In context with the above guidance, the bornite minerals deposit is not included in the cumulative impact assessment in this EIS. Applications for federal or state licensing or permits have not been made, an environmental assessment of the extractive operations and transportation logistics has not been initiated, feasibility studies are still ongoing, the selection of transportation methods and corridors to western Alaska has not been accomplished, and the developer expects the proposal is at least 10 years away from opera-

tion. Thus, the future action is too remote and conjectural in the context of this EIS.

OCS Leasing in the Bering and Chukchi Seas: Under the 5-year OCS leasing schedule (Fig. I.E.-1), several oil and gas lease sales are scheduled in the Bering and Chukchi Seas. These include proposed lease sales 70 (St. George Basin) in 1982, 75 (North Aleutian Shelf) in 1983, 83 (Navarin Basin) in 1984, and 86 (Hope Basin) in 1985, all in the Bering Sea, and proposed sale 85 in 1985 in the Chukchi Sea. The potential for cumulative effects deriving from all these sales is considerable. The need for cumulative effects assessment of OCS leasing must be balanced against the sequential nature of environmental assessments on the proposed lease sales and post-sale operations. In Figure IV.A.8.b.-1, timelines and specific dates are shown for significant decision points regarding the proposed sales. Findings on cumulative effects assessment for these proposed future actions are as follows:

The scheduling of proposed lease sales 57 and 70 is rather close; the pre-sale information in the environmental assessment efforts that characterize each proposal are being completed almost simultaneously. The scheduling of pre-sale environmental assessment information and the sale date for proposed sale 75 is about 10 to 12 months behind sales 57 and 70, respectively.

Given the geographical and chronological proximity of these proposed Bering Sea sales, the Alaska OCS Office is conducting two studies which will aid cumulative effects assessment: exploration and development scenarios for the proposed Bering Sea lease sales, together with the feasibility of interlocking production and transportation systems, are being investigated in Alaska OCS Technical Paper No. 1. Secondly, the Alaska OCS Office is sponsoring a study of the probabilities and economics of commercial hydrocarbon finds in more than one of the above leasing regions in the Bering Sea.

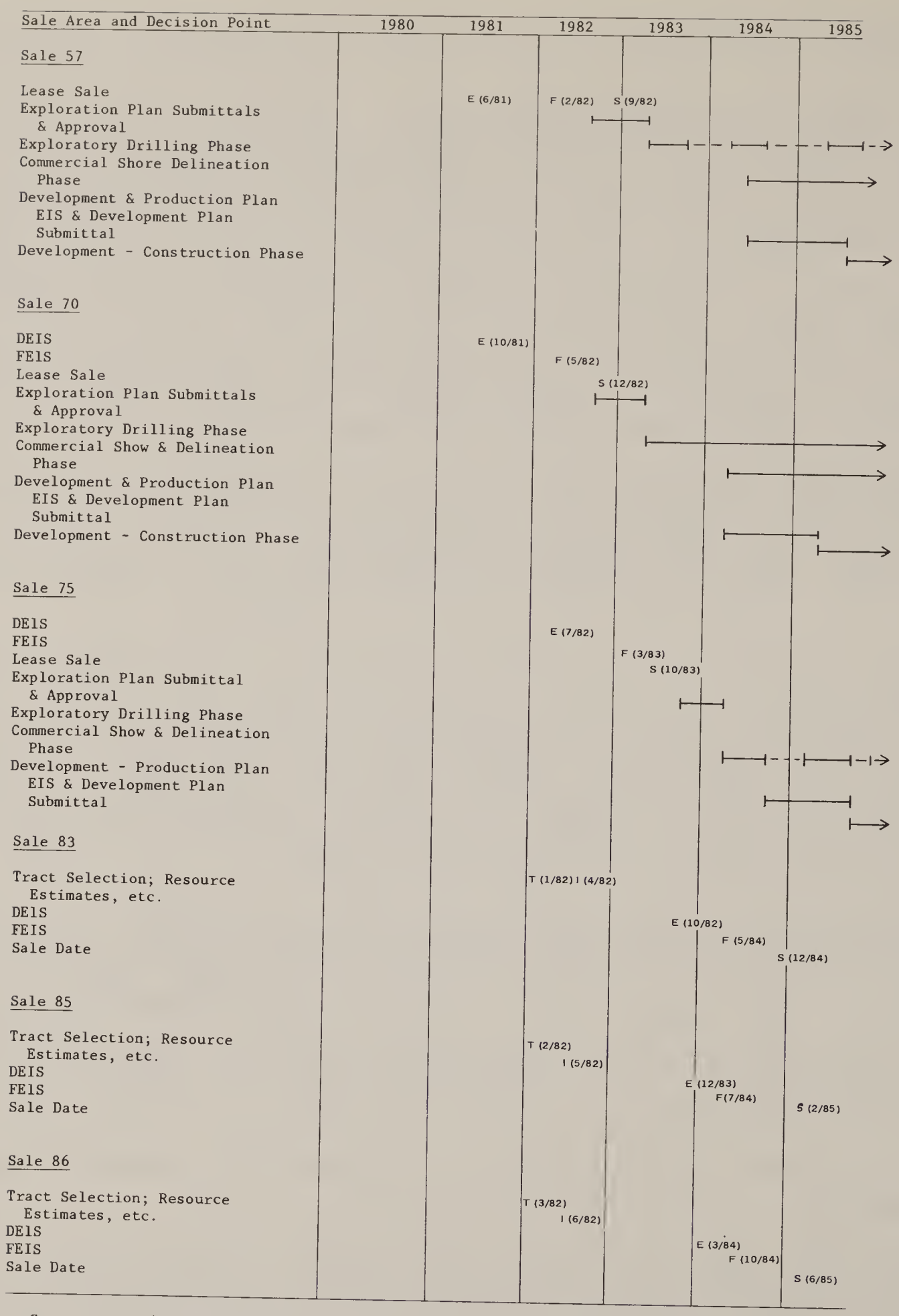
This FEIS on proposed sale 57 will be issued before sufficient information characterizing the proposals for lease sales 83, 85, and 86 is available. This information includes the nomination patterns, selection of blocks for further study in the environmental impact statements, USGS preparation of resource estimates on the selected areas, and the preparation of exploration and development scenarios by the Alaska OCS Office (with the exception of sale 83). Alaska OCS Office Technical Paper No. 1 will incorporate sale 83 for description of scenarios.

In context with the above guidance, the following findings regarding cumulative impact assessment of other OCS lease sales are:

(1) All of the identified OCS sales are included in the national OCS leasing schedule, unless the schedule is formally revised or a Secretarial decision is made to postpone or cancel a proposed sale. In this respect, the proposed sales constitute future actions for cumulative effects assessment in this EIS, even though the post-sale operations are merely presumed and most of the impacts can only be identified in generic terms.

(2) Cumulative effects assessment of individual sales depends upon the physical, biological, or socioeconomic issues being assessed; the geographic range of the resource or activity being investigated; and the degree of confidence the Alaska OCS Office analysts can assign to impact-producing agents, their

FIGURE IV.A.8.b.-1
TIMING OF ENVIRONMENTAL ASSESSMENTS ON PROPOSED BERING AND CHUKCHI SEA SALES[1/]



Sources: BLM/Alaska OCS Office Technical Paper No. 1., 1981; BLM/OCS National OCS Leasing Schedule.

Notation: E - Draft EIS; F - Final EIS; S - Sale Date; T - Tract Selection Announcement; I - Resource Estimates - Infrastructure Scenario.

1/ Specific assumptions accompany the timing of post-sale operations. These include:

a. 4-6 months exploration plan preparation, submittal and approval.
b. Exploratory drilling.
c. Commercial show occurs 1 year after commencement of exploratory drilling.
d. Development and Production Plan EIS preparation commences with commercial show and takes 1 year for completion and approval.

These are optimistic assumptions on the timing of post-sale operations.

chronology, and the magnitude of their occurrence in other OCS sale areas. Thus, cumulative effects assessment of individual issues, e.g., migrating species, may include OCS sales other than sales 70, 75, 83, 85, and 86, where the application of the above factors warrants such consideration. Alternatively, even with preliminary EIS information being available for proposed OCS sales 70 and 75, the analysis of potential cumulative effects and interaction between these sales and this proposal may be so conjectural with specific issues as to warrant only findings of potential cumulative effect.

(3) It should be emphasized that any cumulative effect assessment between this proposal and subsequent OCS sales in the Bering or Chukchi Seas constitutes an initial, not a final, investigation of the issue. Subsequent opportunities for cumulative effects assessment will be available. These are generally of two types:

(a) The EIS on proposed OCS sales which are scheduled after this proposal would allow for further consideration of cumulative effects. This is true for proposed lease sales 70, 75, 83, 85, and 86. Moreover, post-sale 57 information and decisions taken will aid in more meaningful cumulative effects assessment than is presently available. Specifically, blocks bid upon and leased in sale 57 will have been identified; and the exploration plans, onshore facilities and support proposals, as well as oilspill contingency plans, will have been submitted prior to the preparation of the EIS's on sales 83, 85, and 86.

(b) The environmental assessment on any development and production plans submitted for OCS sales in the Bering Sea or Chukchi Sea will also provide for further consideration of cumulative effects. USGS regulations on environmental assessment accompanying such a plan submittal explicitly mention the need for cumulative effects assessment (30 CFR 250.34-3(b)(1)(ii)). The preparation of a development and production plan provides more realistic and detailed information regarding OCS development and production operations than can be hypothesized in the scenario assumptions which accompany EIS's on OCS leasing proposals. In this respect, cumulative effects assessment of post-sale commercial development and production operations in sale 57 with other proposed lease sales, or post-sale exploration operations, will be more definitive and more useful for decisionmakers.

(4) An initial cumulative effects assessment between this proposal and subsequent OCS leasing proposals does not interfere with the decisionmaker's right, as well as the public's right, to avoid an irretrievable commitment of resources. The CEQ tiering procedure mentioned above requires the preparation of an environmental assessment on only those topics which are ready for decision within a phased proposal. Thus, environmental assessment may be postponed for later phases of a proposal which are not presently ready for decision.

The phasing of cumulative effects assessment of this proposal with other OCS leasing proposals fits the phased decision circumstances described in CEQ's tiering procedure. Presently, no irretrievable commitment of resources is being made, either with regard to this proposal or other proposed leasing regions. Moreover, the timing of additional and more definitive cumulative effects assessment in subsequent EIS's for leasing proposals preserves the integrity of environmental assessment decisions made on the leasing process. (Refer to Technical Paper No. 4 regarding the legal authorities available to

DOI to suspend lease activities or cancel a lease, as well as post-sale operations, if certain threats to the environment justify such action.)

B. Alternative I - Proposal (429 Blocks)

The following sections assess the impacts of oil and gas leasing in the proposed sale area. (See Fig. II.B.1.a.-1.)

1. Impacts on Social Systems:

a. Impacts on Population: The following discussion is based on Ellanna, 1980; Ellanna and Roche, 1976; ISER, 1980; Policy Analysts, 1980; Environmental Services Ltd., 1980; Baring-Gould and Bennett, 1977; and a general literature on social impact assessment, most of which is contained in the Denver Institute's Center for Boomtown Research Bibliography, 1981. According to ISER's SCIMP model, direct population impacts only become significant in the third year of development (1985), when over 1,000 new OCS residents are projected to be added to the Nome area, rising to over 3,000 by the sixth year of development (1988), but not dropping below 1,000 until the ninth year of OCS development activity (1991). Population impacts after this peak period range between 400 and 700, a sizable reduction over the peak period. Assuming close to 3,000 additional workers are housed in an "enclave" settlement for the third to sixth years of development, total resident population of the Nome-Cape Nome area reaches 5,137 in year four, peaks at 6831 in year six, and stabilizes at about 4,400 for most of the remaining developmental period (see Table IV.B.1.a.-1). In contrast, without proposed lease sale 57, the population of the Nome area is 3,451 in 1985 (year four) and increases incrementally during the 1980's and 1990's to only 4,005 by the year 2000 (ISER 1980).

Many of the direct social impacts associated with these projected "boom town" population increases during the peak impact period have been experienced by Nome and neighboring communities like Council and Solomon in Nome's gold rush past. However, present residents of these communities have not experienced these boom-town conditions. The present overwhelmingly Eskimo population of the Norton Sound and Yukon Delta region would be reduced to a minority in the Nome-Cape Nome area for the first time since the turn of the century. Restaurants, bars, the post office, and other commercial and governmental services would experience heavy population pressures for at least 7 years. During this time, it is likely that residents of the Nome-Cape Nome area, for the most part, would accommodate to these population pressures either by withdrawal into family and long-term friendships or by active assimilation into the opportunity structure created around the new oil and gas activity.

Native residents could be expected to also withdraw, but it is likely that their status in the cash economy and predominant subsistence lifestyles might encourage resettlement back to village sites in which they still have close family ties. This is particularly likely for some King Islanders in Nome, who already are considering relocation in the Cape Wooley area. It is possible that some Diomede, Gambell, and Savoonga residents would also relocate, if the prevailing social and political climate in Nome came to be dominated by its white residents, since their present prestige level would probably suffer in the change.

Table IV.B.1.a.-1

Projected Population Estimates, Exploration, Mean Onshore Scenario,
Northern Deletion and Offshore Scenario (Eastern Deletion Alternative)

Year	Non-OCS Case Base Case Population†	Exploration Case Add-on OCS Population*	Mean Case Add-on OCS Population*	Northern Deletion Alternative Add-on OCS Population*	Eastern Deletion: Offshore Loading Alternative Add-on OCS Population*
1982	3252	0	0	0	0
1983	3317	24	228	83	83
1984	3383	62	443	182	105
1985	3451	78	1105	536	254
1986	3520	59	1617	814	283
1987	3590	---	2387	970	275
1988	3662	---	3169	1187	425
1989	3735	---	2755	1137	368
1990	3810	---	1676	993	325
1991	3829	---	998	859	240
1992	3848	---	693	559	204
1993	3867	---	571	529	189
1994	3886	---	533	485	173
1995	3905	---	510	378	164
1996	3925	---	484	365	168
1997	3945	---	432	368	176
1998	3965	---	429	409	172
1999	3985	---	431	400	162
2000	4005	---	428	357	162

† Taken from Policy Analysts, Ltd. (1980), Table 55.
* SCIMP Model Output, TOCSPOP - Encl.

Source: Policy Analysts, Ltd.; Technical Report No. 53; Bering-Norton Petroleum Development Scenarios Local Socioeconomic Systems Analysis, June 1980, Table 55, and ISER, Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models, November, 1980, SCIMP Output.

Native residents of the Nome area who could not relocate during the peak impact period because of current employment, access to medical care, or for other reasons, would suffer stress. Such stress would be associated with new minority status and crowding, including increased health, and alcohol and drug-abuse problems; increased absenteeism; marital difficulties; and increased domestic and inter-personal violence. It is likely that some white residents of Nome acculturated to a more subsistence-dependent lifestyle would also be prone to these stresses. Some Native residents more thoroughly acculturated into the Nome business community could be expected to accommodate and profit from the changes these peak population impacts predict. Results of a recently conducted survey in Nome indicate that 70 percent of Nome residents support OCS development in the "Nome/Norton Sound area" (Environmental Services, Ltd., 1981). Native residents were less supportive than white residents, but not overwhelmingly so, according to E.S.L. This survey also shows that 48 percent of Nome residents would like to see OCS land-based facilities "in or next to the city of Nome," another 28 percent favor "near Cape Nome," and only 24 percent favor "away from Nome area altogether" (E.S.L., 1981).

With the proposal, it is also likely that a few residents of villages all along Norton Sound would be attracted to Nome to seek jobs created in construction, trade, and services associated with OCS population impacts of the proposed action. It can be anticipated that residents of nearby villages accessible to Nome would be the first to explore job opportunities in Nome created by proposed lease sale 57. It is unlikely that Yukon Delta residents, for example, would migrate to Nome since their cultural, social, and political ties are centered primarily in the Bethel and Yukon-Kuskowim Delta areas and secondarily in Anchorage.

These population projections and associated projected consequences are based on assumptions concerning the number of commuters, multiplier effects on population, and development timetables. They do not take into account community negotiations with industry concerning industry policy toward personnel and industrial siting decisions. These negotiations could in themselves mitigate considerably the projections presented here.

Summary: Under the proposed action, direct population impacts, particularly during the peak 7-year maximum development period, would be about 3000 additional residents, or nearly an 88 percent increase over the existing population of 3400. Eskimo residents of the Nome area would find themselves in the minority for the first time since the Nome gold rush. Some Eskimo residents, particularly King Islanders and St. Lawrence and Diomede Islanders, would probably relocate back to their original, or a newly designated, site to continue a subsistence lifestyle. Native residents of Nome not able to relocate could suffer moderate to severe stress associated with the population influx, the changing social and political climate of Nome, and increased crowding, inflation and other boom town conditions. Some village residents, especially those closest to the Nome area, could be expected to migrate to Nome seeking work, particularly in construction, trade and services, as these activities expand with population growth. White residents of Nome, especially the business community and more acculturated Eskimo residents, could be expected to accommodate and, for the most part, welcome the new population and its stimulating economic effects.

Conclusion: Significant change associated with direct OCS-induced population growth (defined as greater than double the annual rate of population growth over a 5-year period) can be expected in the Nome road connected area and Nome Census Division with the proposal. Boom-town conditions, including a nearly 88-percent increase over existing population levels, are projected during the peak 7-year maximum development period. For the Yukon Delta subregion, population-induced impacts are expected to be very unlikely throughout the life of the field.

Effect of Additional Mitigating Measures: Refer to the discussions in Sections IV.B.1.c, and IV.B.1.e, subsistence and infrastructure.

Cumulative Effects: Increased population impacts on Nome could be expected from the Nome Port project, particularly during construction of the facility; from the Lost River Mining project; and, to a lesser extent, from Alaska sale 38. See the discussion in Sections IV.B.1.c., IV.B.1.e., and IV.A.8.

Unavoidable Adverse Effects: The Eskimo population of Nome would become a minority during the peak impact period. Stress associated with this new minority status and correlated lifestyles, world views, and political orientations is unavoidable. Expanded funding for health and social services in Nome could ameliorate some of this stress, although this is outside the authority of the Secretary of the Interior.

b. Impacts on Sociocultural Systems: Social subsystems are those structured relationships of people which provide essential functions for a village. The four social functions essential to the operation of a village are adaptation, goal attainment, integration, and pattern maintenance (Parsons, 1961). Each function has subunits of process which contribute to the attainment of that function. (The indicators mentioned in Section III. B.2. show how well each function is performed.)

The village will be required to adapt to changes in the processes of subsistence, job supply, trading, craft industry, commercial fishing, training, etc., due to changes that may occur to the social, biological, or physical environment. Increasing the village goal-attainment activity (if any of these processes is operating inadequately) is one means of adaptation. Another process is for the village to slow its attainment of goals and ideals, but this is usually considered less satisfactory by any group. On the other hand, it is possible that village people would allow their traditional goals to change, rather than actively seeking to attain them. In Nome, the estimated impact of the proposal on these cultural goals would be high for Eskimos and lower for other groups without an enclave. There are also long-time residents in Nome who would welcome change if it would help them attain their goals. That is, some activities such as trade or industry are more easily performed with increased population. However, the smaller villages around Norton Sound, which have basically a subsistence economy with government subsidy, would not adapt as easily to increased OCS population. They have limited resources, and most of the added population would have diverse characteristics from outside the region.

Integration of the village members into the traditional village society becomes more difficult as new people enter Norton Sound communities. Integration is more difficult when the population is more heterogeneous, which it would be

because of new people who have very diverse backgrounds. Without a separate enclave, the impact of OCS activities on the integration function for the proposal should be moderate. With an enclave, the impact of the proposal on the integration function is only low.

Maintenance for the pattern of traditional and modern institutions becomes more difficult to provide as population increases, since there are more diversifying factors in the population to change the family and other institutions. Impacts on the pattern maintenance function only are estimated to be moderate. Because of diversifying factors, the ability to maintain organization of clinics, hospitals, churches, family, Native councils, and individual lifestyles would decrease with incoming population. A projection of the sociocultural changes is necessary to judge the impact of OCS oil exploration in the future to the year 2000. Such an analysis, though brief, may be found in OCS Technical Report No. 54, pages 83-93. (Most of the following material on impacts is from the Ellanna 1980 study, OCS Technical Report No. 54, Bering-Norton Sociocultural Systems Analysis.)

With the proposal, there would be a gradual and variable shift of Inupiat and Yupik speaking populations from kin-based to non-kin-based alliances, associations, and individual affiliations. To the extent that individuals leave family units in smaller communities to reside in Nome, or an enclave in association with OCS employment, the families of these individuals would experience the loss of a member of the operative kin-group. The individual who relocates would not have the same extensive kinship network on which she or he could rely. In a sense, families that resettle would be subject to this same process. For Inupiat and Yupik individuals, residence in an enclave would be the most extreme form of kin-based isolation, and they would find themselves in a social group with whom they have little or nothing in common. Village residents who relocate to Nome proper would be more likely to have some kinsmen already in residence with whom they could interact. Some of these village residents may temporarily move in with relatives, therefore increasing the average household density of Nome Native families.

Throughout the history of this and other areas of Alaska, the presence of a large number of males located at a work project, even if the location is an enclave, results in a relatively significant incidence of outmarriage of local, primarily Native females, to temporary male project personnel. For example, the skewed demographic structure of the community of Wales is, without question, in large part a result of Wales' proximity to the previous DEW line, now ALASCOM, Tin City site. The northeastern cape military facility on St. Lawrence Island, although even more remote, had similar but much less frequent results. When Nome acted as a ferrying base for aircraft on lend-lease to the Soviet Union during World War II, many women married out and others were left as single parent mothers. The oil industry would unquestionably employ primarily males, and an enclave as projected by Dames and Moore (1980b) about 15 miles from Nome would not effectively deter the outmarriage process. At best, even if outmarriage does not occur, sexual jealousies between resident males and enclave males over local women would inevitably result in family disruption. To the degree that industry activity draws in single females, some interaction with local males may occur, but this would undoubtedly be minimal relative to the alternative situation.

Despite the fact that most employees are projected to be non-Natives, some Native families would undoubtedly be affected. Although the number of families impacted may be relatively small, internal family dynamics may change in some households that may become models of community change, influencing closely interrelated kinsmen. Role differentiation between males and females in most Inupiat and Yupik households emphasizes males as households heads and primary economic providers. Females supplement the family economically, tend to be less mobile than males, are primary providers of child care, and are responsible for most of the domestic duties. To date, opportunities for the cash employment of both males and females have brought about internal family changes in the sense that males frequently leave their home community for temporary periods of time for such employment, thereby leaving females as functional family heads. As such, they gain greater degrees of independence. Social service agencies noted that this trend was a prevalent by-product of Trans-Alaska Pipeline employment of Native males from villages throughout the state. A beneficial aspect of OCS development near these villages is that the male could work in OCS or service-related jobs without leaving the village. In some cases, females have become more involved in local subsistence activities usually and more traditionally confined to males. Commonly, in recent times, many females have also become increasingly more involved in village full- and part-time employment, other than subsistence, in part because such positions restrict male subsistence mobility. Although not well documented, family conflicts over females assuming larger or primary "provider" roles and traveling alone outside of the village in conjunction with employment have become more prevalent in response to these economic shifts. The possibility of Native females being employed either directly in industry-related jobs (a likely possibility for some because of their duplicated "minority" status), or indirectly in secondary service sector positions, may present added impetus to these changing family patterns while simultaneously providing a new source of cash. (See TR 54, Vol. II, pp. 74-97 and 97-140.)

Because of unequal amounts of cash available to regional residents as a result of direct or indirect OCS employment, there would be a trend (previously discussed), towards more complex economic and, hence, social stratification. The cash to acquire technology that is presently desirable may continue to allow and encourage the development of what has been referred to as a "new type of skinboat captain (umealiqs)," or entry into a significant social subgroup. The criteria for membership becomes modified to include access to cash. More traditional lines of authority may be disrupted in such a projection. As Graburn (1969) notes for Canadian Inupiat, social norms applying to mutual or reciprocal obligations and equality would also undergo more rapid and extensive change.

The vast majority of social system impacts based on the proposal would be focused in Nome, rather than in small Native communities. To the degree that some individuals and families from villages would participate in Nome life during this time, and as the villages continue to depend on Nome for regional services, some effects of a similar but much less direct or intense nature would be experienced outside of Nome and its relatively immediate vicinity.

Interethnic Attitudes and Relationships: The demographic structure (e.g., age, sex, ethnic ratio) of the Nome community has remained relatively stable since World War II and is projected to change only minimally in the non-OCS case. In the proposal, this demographic structure would be transformed in character.

The ratio of males to females would increase, and there would probably be an increase in the age associations of persons 25-35 years old. Social interaction in Nome would be considerable with an enclave about 15 miles or less by road from Nome. The social structure of the community today includes many features of traditional Inupiat and Yupik cultures, including extended family households, networks of functional kinship ties and interactions, a high incidence of interpersonal interaction, informally derived respect and authority, and stratification between families focused on success at subsistence endeavors and access to subsistence technology. Although these non-western elements of social structure still prevail today, they certainly would be in the vast minority under the OCS proposal-induced social conditions in Nome. Nome would acquire a new demographic profile with a much greater percentage of males 25-40 years of age, a larger adult population overall, a greater number of single individual and married couple households with a small average number of children, and a few extended family households. This population would be extremely transient in nature, and large segments (possibly up to 60%) would turn over on the average of every 2 years. Household density would be considerably less for all of Nome's population, except for the households of long-term Native Nome residents. In terms of social interaction, however, the community character would probably become more impersonal, its Eskimo population would probably be a "minority" in the real and perceived sense, social stratification would probably become more obvious and functionally operative, and non-kin common-interest associations would dominate the social structure. Not only would there be a recognizable ethnic shift, but long-term, "old-timer," non-Natives would also find themselves in the position of being both a real and perceived minority in the minimum-use social scene (see Appendix F-1); indeed, a somewhat unique situation in Nome's history. An enclave residential unit located in the immediate vicinity of Nome, Elim, or Golovin would only marginally mitigate these projections.

Interethnic relationships between American Indians and non-Indian Americans, in general, and Eskimos and non-Eskimos specifically, have been explored in several publications (e.g., Braroe, 1975; Chance, 1965; Graburn, 1969; Hughes, 1960; Jones, 1976; Marston, 1969; Senungetuk, 1971; Spindler, 1977, and others). Some insights from these works will be used here for purposes of projection.

Nome is typical of more or less remote expending communities (see Freudenberg, 1978) composed of a wide array of ethnic affiliations, previous life histories, educational and training expertise, interests, religious affinities, and normative behavior. For this reason, it can be said with a high degree of certainty that Nome, more than any other community of this size, has a level of social flexibility that would be relatively adaptive to or tolerant of the level of OCS-related in-migration projected in the OCS proposal. Such flexibility has limits, however, and the process of assimilating such individual and social diversity creates internal stress on members of such a community.

The primary focus of stress and conflict in this particular instance is closely related to the ethnic structure previously described. For three-quarters of a century, a minority of non-Natives, Russian and American traders, and gold seekers economically and politically dominated an Eskimo majority in the villages who were Natives of the region (although not so in Nome specifically). Although enslavement, relocation, and conscription were not usual practices,

more subtle means of domination resulted, producing for many Eskimos who were exposed to non-Natives a feeling of inferiority and nonacceptance by "whites" and resulting in suppressed hostilities. Over the intervening years, internal adjustments have improved interethnic relations to some extent. For many from all ethnic groups, mutual tolerance and respect have been the end result of lengthy understanding and communication. Mutual stereotyping, based on ignorance and lack of interpersonal contact exists, but not nearly to as great a degree as in some urban multi-ethnic community settings. To this scene have come and gone short-term, non-Native residents in relatively small numbers. Some of them have learned and developed a respect and understanding of cultural and individual differences; others have come equipped with negative preconceptions of cultural differences that are only reaffirmed by experiences in residence.

The increase of interethnic conflict in response to this major demographic shift cannot be measured in terms of a simple one-to-one ratio but is very complex. For example, each instance of visible or invisible, direct or indirect, simple or plain interethnic hostility, prejudicial judgment, or biased interpersonal evaluation will have cumulative effects at the individual level. That is, negative expectations will be manifested when there is a greater frequency of conflict.

Nome would no longer resemble the quasi-urban Native "town" it is today and would probably become, similar to what it was at the time of its origin, a "gold-rush" town. The interaction of the still primarily Inupiat and Yupik villages with this non-Native town would probably become less comfortable, more hostile, and less comprehensible. There is some question that the majority of Natives in this setting, with the exception of educated leaders, skilled technicians, and professionals, would become part of the perceived lower socioeconomic class in a town newly populated in its majority by a largely similar group of non-Native oil workers. Those who remain as part of the stable population would exceed all other presently existing social segments of Nome's population. Nome's present flexibility as a community, which accepts a widely divergent population, would probably diminish.

Indicators Negative and Positve of Response to Change: The proposal would probably involve more negative responses to change on the part of the Inupiat and Yupik population than on the part of the non-Native population. While not accurately quantifiable for reasons previously discussed, it is projected that indices of negative change (e.g., suicide, alcohol and other drug abuse, homicides, family disintegration, etc.) would increase for the following reasons:

- Native animosities and anxieties resulting from the rapid and intense growth of the non-Native population, projected in this case, would probably result in a high escalation of all of these indices.

- Because of the population increase and non-local origins of the majority of this population, the Nome community would probably take on a less personal character. Face-to-face relationships with familiar individuals would decrease in frequency. This context is one in which interpersonal conflict may escalate; and behavior restraints operative between acquaintances, friends, or kinsmen would be rendered less effective. Both violent and non-violent crimes could be expected to multiply.

- Stress related to sexual competition, primarily for local females; increased economic stratification, and increased alcohol and other drug use and abuse would result in a decline in overall family solidarity for both Natives and non-Natives but probably more so for Native families living in Nome who would have recently come from the villages. They would have fewer adaptive skills for coping with town life.

- According to professional mental health personnel in Nome today (see Alaska Vital Statistics 1970-1974), there is a significant number of residents of Nome and the villages who are only marginally functioning under current social conditions. Added stress resulting from a rapid population expansion, economic inflation, potential threats to subsistence, increased regulatory control, economic and social stratification, and a more impersonal social setting may be adequate impetus to push some of these individuals "over the edge," resulting in potential suicide. (See causes of anomic suicide in Durkheim, 1951.)

Indices of positive response to change would generally focus on the realization of an OCS find.

- An attitude of economic optimism, speculation, and an improved real and perceived standard of living for a percentage of the local population that may directly or indirectly benefit from OCS development would become apparent.

- OCS development may result in an improvement of Nome's physical setting which would probably be perceived as an improvement in the quality of life.

- If industry continues its efforts to create a responsible and concerned public image, this could possibly result in some level of fiscal contribution to both local social needs (education, medical care, mental health care, communications expansion, etc.) and positive community functions.

- A population increase and related economic investment by business owners may result in improved local entertainment and recreational opportunities (e.g., restaurants, theaters, etc.).

- If the Norton Sound organizes as a borough, it will be able to raise revenues through taxing onshore OCS facilities, as suggested by AOGA (comments on EIS, October 15, 1981).

Conclusion: Impacts of the proposal on sociocultural resources, based on the preceding indicators, is considered to be moderate. There would be an accelerated trend towards social stratification, and a gradual shift to non-kin based Inupiat and Yupik social structure.

Effect of Additional Mitigating Measures: If the suggested Orientation Program measure contained discussions of the present people, their institutions, the functions of those institutions and groups, and the effects that contacts by OCS-related employees in the villages could have, then with increased understanding, the orientation program could lessen the impacts, but could not totally mitigate them.

Cumulative Effects: Impacts from discoveries in the Norton Sound area combined with the proposed state sale, the Calista Corporation oil and gas lobby, possible tanker traffic from Navarin Basin sale 83, Chukchi sale 85, and Hope Basin sale 86, port developed in Nome, and hard minerals mining are possible during the exploration and development of the proposed Norton Sound 57 lease sale. With these projects, the sociocultural change over a longer time period is estimated to be moderate without the enclave. This is because of immergent effects of diverse projects. With an enclave, cumulative impacts would be reduced considerably.

Unavoidable Adverse Effects: Unavoidable adverse effects on the sociocultural systems are expected to be relatively low for the villages and slightly higher for Nome under the proposal.

c. Impacts on Subsistence Patterns: "Subsistence" is the traditional way of life of the Eskimo residents of the Bering Strait, Norton Sound, and Yukon Delta areas. It encompasses economy, culture, and social and political organization, traditional religious beliefs, and recurring practices; celebrations; and norms of behavior common to each culture group. These are all interrelated with use of and dependence on local land and marine resources. Section III.B.3. provides definitions of "subsistence uses"; subsistence patterns characteristic in the Bering Strait, Norton Sound, and Yukon Delta regions; and seasonal use patterns by species. For purposes of this impact assessment, primary resources are defined as those resources contributing substantially to family diet, and important cultural elements both as foods for important community events and as activities around which family and community life are centered and organized. Primary subsistence resources are not only essential to the daily life and diet of resident villagers, but they provide the economic security normally associated with money in a cash economy.

Secondary resources are for the most part less frequently employed or available in the local area. Some of the distinction between primary and secondary resources is evident in village subsistence calendar data collected in 1974 and 1976 in the Yukon-Kuskokwim Delta and reproduced by Nunam Kitlutsisti and the Association of Village Council Presidents (Table III.B.4.-1).

It is clear from these data that the village of Kotlik is over 80-percent dependent upon fish, while Alakanuk depends more heavily on sea mammals (22 percent with 60-percent dependence on fish). Emmonak harvests more birds than the other two villages. These patterns of subsistence harvest may be long-lasting village preferences for certain foods or may reflect the shorter term availability of certain resources to that local community. If longer term statistics were available, it is likely that fluctuations in these patterns would be evident, reflecting (among other factors) change in hunting and fishing pressure, population composition of the village, availability of other sources of food and local cash resources. Table III.B.4.-2 provides a similar distribution of mammals, fish, fowl, and plants for Bering Strait and Norton Sound villages, adapted from Selkregg 1976.

Alteration of the environment in which subsistence harvesting takes place has a number of consequences which can be analytically separated for purposes of impact assessment. First, alteration in the food resources available locally would affect subsistence take of fish, sea mammals, birds, or vegetation.

This could occur as a direct result of alteration of habitat or disturbance of habitat or biological resources themselves as the result of onshore construction or gravel extraction activities; disturbance of feeding or reproductive activity of primary subsistence resources such as the bowhead, gray, and beluga whales, bearded and other seals, walrus, or salmon; contamination of biological resources or habitat by oilspills; diversion of village subsistence efforts by offshore or onshore facility siting; diversion of hunting and fishing efforts in the event of an oilspill and subsequent efforts to cleanup the spill; and increased costs associated with obtaining subsistence resources if these resources were locally depleted or if populations were significantly reduced, or relocated as the result of disturbance.

Table IV.B.1.c.-1 presents an overview of probable relationships between subsistence species and major sources of disturbance, providing a generalized assessment of sensitivity to disturbance. Three areas of potential sensitivity are compared for purposes of this assessment: oilspills, exploration and development impacts, and harvest pressure. The reader should consult the specific biological resource impact assessments found in Section IV.B.2. for specific species and their unique sensitivities or vulnerabilities to various types of disturbance. Table IV.B.1.c.-1 is meant as an overview only to attempt to relate the potential effects of various factors on primary and secondary subsistence resources. The table can be used to assess a range of potential impacts to the people who are dependent upon these resources with the aid of the Oilspill Risk Analysis, other impact assessments concerning Inupiat subsistence, and sociocultural studies conducted specifically for this proposed lease sale area.

Oilspill Risk Analysis: The areas of greatest oilspill risk in this proposed lease sale area, within a 10-day period, in order of greatest potential risk, are included in Appendix J. Species known to be most vulnerable to oilspill risk include various seabirds, including oldsquaw, eiders and auklets, black brant, and murre; fish and shellfish including herring, whitefish, clams, and mussels and, to a lesser extent, smelt and grayling. If sufficient numbers of these populations were affected, effects on subsistence take for the villages of St. Michael, Stebbins, Unalakleet, Shaktoolik, Elim, Moses Point, and Golovin could occur. This is unlikely, however, given the probable use of gravel islands for exploration and development and given the prevailing winds and currents which reduce the likelihood of oilspill "spread" to the beaches of Norton Sound or the Yukon Delta.

Species most sensitive to noise and other disturbances associated with exploration, construction, and development activities include ringed seals; seabirds; and some fish including herring, grayling, pike, and least cisco; and, to a lesser extent, other whales, seals, and land animals. Noise disturbance and construction impacts could affect villages closest to the Cape Nome site, if onshore development occurs. Traffic to and from offshore platforms could affect Bering Strait island villages and other villages on the flight path to Nome airport, if mitigating measures to protect birds and marine mammals affected by air noise were not implemented. If these mitigating measures were implemented, then noise disturbance would be minimized. Similarly, mitigating measures reducing disturbance from seismic and tanker noise would mitigate effects on villages dependent on species affected by these noises.

Table IV.B.1.c.-1
Biotic Resources Utilized by Residents of the Bering Strait/Norton Sound Area and Their Relative Sensitivity to Three Types of Disturbance*

Common Name	Relative Sensitivity to		
rimary Food and w Material Sources	Oilspills*	Other Exploration and Development Impacts*	Harvest Pressure**
Whale, Bowhead	Low-Moderate	Low-Moderate	High
Whale, Beluga	Low-Moderate	Low-Moderate	Moderate
Walrus, Pacific	Low-Moderate	Low	Moderate
Seal, bearded (ugruk or mukluk)	Low	Low	Low-Moderate
Seal, harbor or spotted	Low	Low-Moderate	Low
Seal, ringed	Moderate	Moderate-High	Moderate-High (localized effect)
Salmon, king	Moderate	Low	High
Salmon, silver	Moderate	Low	High
Salmon, chum	Moderate	Low	High
Salmon, humpback	Moderate	Low	High
Salmon, sockeye	Moderate	Low	High
Moose	Very Low	Moderate	High
Caribou or reindeer	Very Low	Moderate	High
Whitefish, broad	Moderate	Low	Low
Whitefish, humpback	Moderate	Low	Low
Sheefish	Moderate	Low	Moderate (state (not a popular sportfish
condary Food and w Material Sources			
Seal, ribbon	Low	Low-Moderate	Low-Moderate
Whale, gray	Low-Moderate	Low-Moderate	Moderate-High
Bear, polar	Low	Low-Moderate	Moderate
Bear, black	Very Low	Low-Moderate	Moderate
Bear, grizzly	Very Low	Low-Moderate	Moderate
Beaver	Very Low	Low-Moderate	Moderate
Squirrel, arctic ground	Very Low	Low-Moderate	Moderate
Porcupine	Very Low	Low-Moderate	Moderate
Hare, snowshoe	Very Low	Low-Moderate	Moderate
Auklet, least	Very High	Moderate	Low
Auklet, crested	Very High	Moderate	Low
Auklet, parakeet	Very High	Moderate	Low
Eider (several species)	High-Very High	Moderate	Low-Moderate
Oldsquaw	High	Moderate	Low-Moderate
Pintail	Moderate-Low	Low	Low-Moderate
Brant, black	High	Moderate	Moderate-High
Goose, snow	Low	Moderate	Moderate
Goose, white-fronted	Low	Moderate	Moderate-High
Crane	Low	Moderate	Moderate-High
Murre, common (particularly eggs)	High	Moderate	Low

Table IV.B.1.c.-1
Biotic Resources Utilized by Residents of the Bering Strait/Norton Sound Area and Their Relative Sensitivity to Three Types of Disturbance*
(continued)

Common Name Primary Food and Raw Material Sources	Relative Sensitivity to Oilspills*	Other Exploration and Development Impacts*	Harvest Pressure**
Murre, thick-billed (particularly eggs)	High	Moderate	Low
Ptarmigan, willow	Very Low	Moderate	Moderate
Ptarmigan, rock	Very Low	Moderate	Moderate
Crab, king	Moderate	Low	Low
Crab, tanner	Moderate	Low	Low
Clams	High	Low	Low
Blackfish	Low	Low	Low
Char, arctic	Low	Low	Low
Cod, saffron	Low	Low	Low
Tomcod, Pacific	Low	Low	Low
Flounder, arctic	Low	Low	Low
Grayling	Low	Moderate	Moderate
Pike, northern	Low	Moderate	Moderate
Cisco, least	Low	Moderate	Moderate
Herring, Pacific	High	Moderate	High
Halibut, Pacific	Low	Low	Low
Smelt	Moderate	Low	Low
Mussels (several species)	High	Low	Low
Sculpin	Low	Low	Low
Burbot	Low	Lot	Low
Whitefish	Moderate	Low	Low

Source: Ellanna, 1980, Technical Report No. 54, Vol. 1; and Alaska OCS Office staff.

* Assessments of relative population sensitivity to oilspills and are generalized assessment, based on the experience of OCS staff, their literature review and in-house discussion. For the most part they are generalized assessments, provided here to attempt a better linkage between subsistence use of resources and biological assessments. They are not meant to substitute for the detailed assessments by life stage and location found in the separate biological assessments in Section IV.C. or the assessment of impacts on subsistence patterns in Section IV.B.1.c.

**Harvest pressure impacts for birds cannot be reliably assessed by species.

Refer also to Table IV.B.2.b.-1 for fish life stages and oil interactions and to OCS Technic Papers Nos. 3 and 4, 1981, by Hansen and Cowles.

The reader is referred to Appendix J, Tables 7 through 22, which show the specific probability calculations for both smaller (under 1,000 bbls) and larger (over 10,000 bbls) spills, and to figures J-1 through J-3 which graphically portray targets discussed below. For the proposal, the overall probability of oilspills contacting one of the marine targets is:

	Within 10 days	
	Greater than 1000 bbls	Greater than 10,000 bbls
(1) Gray whale target (Chirikof Basin)	75%	47%
(2) Mid-boundary target No. 5 (winter season) (Chirikof Basin)	53%	28%
(3) King crab feeding area (summer season) (Sledge Island to Golovin Bay)	43%	20%
(4) Seabird foraging area target No. 2 (winter season) off Sledge Island	36%	16%
(5) Mid-boundary target No. 1 (summer season) (Nome to Golovin Bay)	35%	16%
(6) Mid-boundary target No. 4 (winter season) (Cherikof Basin South)	26%	11%

It will be noted that the highest probability calculations are associated with small spills. Only three marine targets show more than 20 percent probability of a larger oilspill contacting the target in 10 days. These areas are all on the tanker route or in the vicinity of Cape Nome facilities. On the other hand, while an oilspill may be statistically probable over the life of the field, the actual occurrence of oilspill events in Alaska OCS waters has been extremely limited, according to E.P.A. and U.S. Coast Guard statistics (sale 60 industry EIS testimony).

These six offshore areas have the highest average risk of a potential oilspill reaching their boundary area within a 10-day travel-time period. Larger targets, like the gray whale feeding target, have higher probabilities of oilspill contact, partially because of the size of the target. On the other hand, the probabilities associated with target "hits" are a function of oceanographic conditions of the area and are therefore useful predictors of the direction of oilspill travel from various launch points within the proposed lease sale. Given the above high-risk areas, we can identify the villages most likely to be affected if an oilspill event occurred and spilled oil in the targeted area.

(1) Gray Whale Feeding Area in Chirikof Basin: The villages most likely to be affected by an oilspill in this area are the whaling and walrus hunting villages of the Bering Strait subregion: Savoonga, Gambell, King Island, Diomede, Nome sub-communities.

(2) Mid-Boundary Target No. 5 in Chirikof Basin: The villages most likely to be affected by an oilspill in this area are the whaling and walrus hunting villages of the Bering Strait subregion: Savoonga, Gambell, King Island, Diomede, Nome sub-communities.

(3) King Crab Summer Target: Villages from Nome to Golovin Bay, including Nome, Solomon, White Mountain, Golovin, and Council--perhaps also Elim, Moses Point, Koyuk, and Shaktoolik commercial fishery are Nome based.

(4) Seabird Foraging Area No. 2 Off Sledge Island: Nome, King Islanders in Nome.

(5) Mid-Boundary Target No. 1--Summer Season: All villages from Nome to Unalakleet dependent on this area for summer sealing and fishing: Nome, Solomon, Council, White Mountain, Golovin, Elim, Moses Point, Koyuk, Shaktoolik, and Unalakleet.

(6) Mid-Boundary Target No. 4--Winter Season: Yukon Delta villages, particularly those dependent on fall marine mammal migrations: Kotlik, Alakanuk, Emmonak, and Mountain Village; also perhaps Gambell and Savoonga on St. Lawrence Island, in the unlikely case of a larger oilspill.

Effects on villages would depend on a number of factors including, among others, size of the spill, winter or summer weather conditions, availability and deployment of oilspill cleanup equipment, and the number of biological resources in the area at the time and their response to oil contact. A range of probable effects can be anticipated, however. Winter oilspills off Sledge Island near Nome could affect winter subsistence efforts and harvests of affected villages at a time when household stocks of subsistence foods are low. Summer oiling in the vicinity of primary sealing and walrus hunting areas (approximated by mid-boundary target No. 1) could reduce subsistence harvest of seals and walrus, at least temporarily. A major oilspill which displaced or reduced the population of walrus or of bowhead or gray whales (gray whale feeding area) could substantially stress villages whose whole culture is centered and organized around whaling and walrus-hunting activities (Gambell and Savoonga). These stresses to villages would occur if there were substantial changes in animal distribution or if subsistence harvest activities were disrupted because of a major cleanup effort.

Nevertheless, as discussed in Section IV.B.2.d., localized direct and indirect effects on marine mammals may occur but are generally unlikely.

Potential tainting of sea mammals, birds, and fish, and the psychological stress caused by the fear of oilspill pollution of one's "garden," are not quantifiable but are real concerns of the residents in this region. Significant and meaningful village participation in oilspill cleanup efforts and planning could mitigate some of these fears and concerns.

Impacts on endangered whales are discussed in Section IV.B.2.e. and on non-endangered marine mammals (including spotted, ringed, bearded, and ribbon seals; walrus; beluga, minke, and killer whales; as well as polar bear) in Section IV.B.2.d. Oilspill effects, noise disturbance, habitat disruption, and other direct and indirect effects on these species could indirectly affect subsistence use, if these disturbances encourage withdrawal or avoidance of an area by a particular species; if disturbance contributed to significant declines in favored species; or if reductions in prey species reduced populations of these marine mammals. In virtually all of these cases, while individuals within populations may be affected, population levels are not expected to decline, according to the above assessments.

Impacts on seabirds and coastal birds would also affect villages dependent on them for subsistence. Yukon Delta villages in particular could be affected by both oilspill contact on living birds and by persistence of oil in the delta

environment. (See Sections IV.B.2.a. and c.) Oilspill and construction-related impacts on fish, particularly salmon, sheefish, and whitefish are expected to be moderate to low according to Table IV.B.1.c.-3. Since inner Norton Sound and Yukon Delta oilspill targets generally are low in risk to oilspills, according to the oilspill risk analysis, it is expected that impacts on predominately fisheries-based villages will also be unlikely with the proposed lease sale. The only possible exception to this statement is the 26-percent overall probability of an oilspill contacting mid-boundary target number 4 during winter in the southern Chirikov Basin, southeast of St. Lawrence Island. Impacts on fisheries are discussed in Section IV.B.2.b.

Onshore Impacts: If development occurs, the onshore impacts and pipeline demands of the various transportation scenarios suggest an undetermined disruption of onshore terrestrial habitat in the Cape Nome to Nome area. Most of this onshore disturbance to wildlife would occur close to the Cape Nome siting of facilities. There is a potential for considerable short-term competition between sport and subsistence users of fish and game in the Nome-Cape Nome area. If new residents working in OCS-related jobs undergo an orientation to the area, and if their long hours and relative transiency in the area encourage out-migration during off hours, then it is unlikely that exploration phase work forces would significantly add to harvest pressure on fish and game populations. With onshore development, however, an additional 228 to 3,169 OCS-related residents during the 1983 to 1987 period are projected, dropping off gradually to slightly over 400 by the year 2000 (see Table IV.B.1.a.-1). By 1984, 1,105 OCS non-enclave residents could begin significantly affecting local use of fish and game, local game management of these species, and town-OCS resident relationships relating to fish and game harvests--particularly moose, salmon, and other fish, ducks and geese, and small game on the Seward Peninsula. During the period 1984 through 1991, anticipated OCS resident population is assumed to range from 1,105 in 1984, to a peak of 3,169 in 1988, to 998 in 1991. During these peak population years, it can be anticipated that harvest pressure and competition would be most intense, dropping off as OCS-related population declines. This assessment is based on the assumption that industry-community negotiations concerning harvests of fish and game do not occur. If, as in the case of Yakutat, industry-community negotiations do limit fish and game harvests by non-residents, much of these assumed conflicts may not occur, or may be less intense if they do occur.

Harvest Pressure and Other Sociocultural Impacts: Another important potential effect resulting from the proposed lease sale is the interaction likely to occur between industrially-oriented populations and the predominant Eskimo population of the Norton Basin region. The issue of cash inducements to ivory sales is already a matter of controversy in the region and the state and could be expected to intensify with industrial development in the area. Value conflicts between regional and village corporation leaders and stockholders concerning the direction of corporate policies could intensify, particularly where land sales affect subsistence use of lands.

Increased cash in the region would provide increasing opportunity to realize important cultural values. Insofar as subsistence activities, including whaling and sea mammal hunting are associated with premier cultural values, it is likely that individuals formerly unable to afford participation in these activities would avail themselves of this opportunity. This could increase

harvest pressure on large marine mammals in particular and also perhaps on the beluga whales, as well as the ringed and spotted seals.

Ellanna (1980) and Nunam Kitlutsisti (1980) have suggested that the availability of increased cash to young men of hunting age not only increases the number of hunters who can afford to engage in prestigious hunts but may also encourage hunting practices which are more efficient in time and quantities taken.

Related to this potential increase in harvest pressure is increased regulation which, from a local perspective, is often seen as harassment. The increasing stress normally felt by municipal governments in energy boom towns can be expected to be felt in the Norton Sound region by key leadership groups of the subsistence economy--particularly the Alaska Eskimo Walrus Commission; the Eskimo Whaling Commission; and Kawerak, Inc.--and in the Calista region, Nunam Kitlutsisti, and the Association of Village Council Presidents (AVCP).

Another likely effect of oil and gas activity in the area would be an unknown reduction in the amount of sharing and distribution of food, raw materials, and services associated with a subsistence system. Ellanna and others report that cash is not shared as readily or as widely as are subsistence foods. Increasing cash in the economy would, therefore, have the effect of reducing sharing which would, in turn, affect family and other social relationships. If widespread, community cohesion might be threatened.

Ellanna also reports that cost inflation of housing and fuel in Nome might encourage local plans by indigenous village populations to relocate back to their original village sites or to a site more recently chosen during the settlement of land claims. For example, King Islanders in Nome might accelerate plans to relocate to the Cape Wooley area to take advantage of the area's locally available resources and to return to a less cash-dependent lifestyle. It is also likely that some Nome Eskimo people who are unable to afford increasing housing costs and other urban amenities, yet participate less actively in the subsistence economy, would become marginal both to subsistence and cash economies in Nome, adding strain to the medical and social service delivery systems.

Summary: Oilfield development could affect village harvests dependent on the Sledge Island to St. Lawrence Island area (Chirikof Basin) for sealing, beluga whaling, walrus, and whale hunting. Villages most likely to be affected are Eskimo populations of Nome, including the King Island community; Diomede Islanders in Nome; St. Lawrence Islanders in Nome; and residents of Gambell, Savoonga, and Diomede. Of these villages, Savoonga residents would be most affected since their offshore (and onshore) hunting areas are relatively vulnerable, compared to other areas. Onshore impacts and associated activities, potential competition and conflict between sport and subsistence activities could be significant, particularly in the 1984 to 1991 onshore development period. During exploration, onshore impacts are considered insignificant. Harvest pressure on biological resources of high cultural value can be expected to increase with the increased interaction of industrially-oriented populations with local residents. Marine mammals in particular may be affected. Increased cash in the economy could reduce sharing of fish and game to an unknown extent, which over time could affect community cohesion.

For village residents throughout the lease sale area accustomed to a traditional seasonal round of subsistence activities, industrial development in the area and the increased opportunities provided by this development would add qualitatively to the complexity of individual lives and create opportunities for other changes, both positive and negative. All possible ramifications to subsistence are beyond the scope of this EIS. For greater detail on potential impacts, see Ellanna, 1980, Volume II.

The above analysis of effects on subsistence use, take, and village subsistence-based economies is based on a series of assumptions and models, including the oilspill risk analysis, ISER MAP and SCIMP model projections, and assumptions and projections which form the basis of the scenario's used throughout this EIS. If the proposed action were to deviate significantly from these projections, then specific village-level impacts would also differ, although generalized discussion of potential risk would remain valid.

Conclusion: While some changes in local subsistence use and take may occur with this proposal, the probability of significant disturbance, in the form of long-term reduction of subsistence take, large-scale disruption of subsistence harvesting activities, or significant reductions in primary resources utilized for subsistence is unlikely for the region as a whole. For Savoonga, and to a lesser extent other "big sea mammal hunting" villages (Diomede, Gambell, King Island, Wales) due to a relatively greater vulnerability to oilspill events, the short-term disturbance is more likely, particularly during the peak development period.

Effect of Additional Mitigating Measures: For the proposed lease sale, the following measures could mitigate some of the impacts expected to occur on subsistence use areas and villages in the Norton Sound area: Protection of Cultural Resources and the Orientation Program (if it consisted of sufficient detail concerning subsistence lifestyles and activities to prepare industry workers to avoid disturbing activities) could provide significant mitigation. The potential Information to Lessees that contain language which warns of potential disturbance to subsistence species; alerts non-residents to culturally significant sites; alerts lessees to the need for avoiding disturbance of subsistence activities in progress; and potentially provides forums for two areas of conflict with subsistence-use activities, oilspill contingency planning, and other types of oil industry-environmental conflicts requiring assistance from an inter-agency biological task force are as follows:

Information on Bird and Marine Mammal Protection,
Information on Iditarod National Historic Trail,
Information on Subsistence Activities, and
Information Oilspill Contingency Plans

(Refer to Section II.B.1.c. for further discussions on potential mitigating measures.)

The suggested seasonal drilling measure for specified blocks (see Fig. II.B.1.c.-1) could benefit all the Norton Sound villages dependent on walrus, whales, and seals, particularly those marine mammals who migrate past the Delta. During preparation and review of the DEIS, the option of applying the seasonal drilling measure to the entire area was analyzed. While this would offer a small amount of extra protection to the entire area, it was felt

the measure was more appropriate for the western most blocks. The Secretary may modify the wording of any stipulation prior to the final sale notice. Most subsistence hunting of these marine mammals occur in either spring or fall during their migration into and out of the area (see Table III.B.3.-1). Protection of these species from significant disturbance would indirectly, but significantly, protect villages dependent upon them for subsistence. In the case of endangered whales, and walrus in particular, this added measure of protection could help assure the continuance of extremely important cultural practices associated with whaling and walrus hunting that are central to Inupiat and Yupik Eskimo identity, as well as village social and cultural organization.

Protection against oilspill and habitat disturbances in the Yukon Delta, provided by the potential Measure for Areas of Special Concern (Sec. II.B.1.c.) would help protect subsistence uses in this valuable habitat.

As Figure IV.B.1.c.-1 graphically shows, human use of the Yukon Delta is much more extensive than permanent village sites indicate. Virtually every portion of the Delta is used in summer by both coastal and inland village residents who establish fish camps for salmon fishing, berry picking, and some other fishing and hunting. A family's yearly store of dried fish is typically harvested and prepared during this residence in summer fish camps (Wolf, 1981). Reduction of risk to this valuable habitat and site of extensive hunting and fishing activity would provide protection to both coastal and inland villages dependent upon its resources.

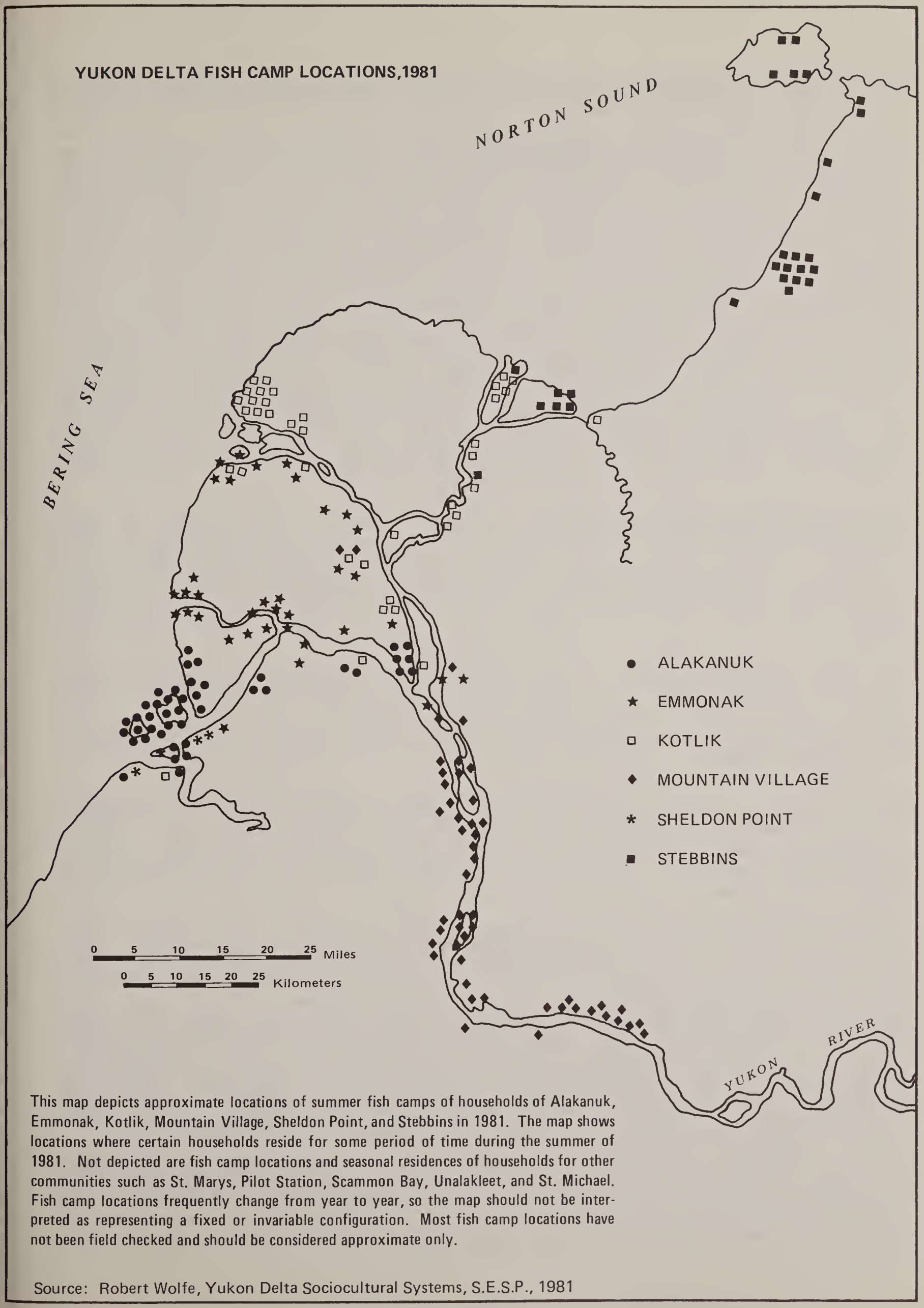
Reduction of noise distrubance associated with this measure of special concern would help protect beluga whales utilized by all Yukon Delta villages, but especially Emmonak and Alakanuk.

Cumulative Effects:

Port of Nome Deepwater Terminal: Alteration of habitat in the Nome port area; human disturbance associated with the construction activity; short-term noise; and other disturbance to local marine mammals, fish, and game can be expected from this proposed project. Local subsistence harvests of species in the construction area would be interrupted until the project was completed. Long-term effects of species disturbance are discussed in Section IV.B.2. Localized short-term effects on subsistence harvests can be expected, with some diversion of subsistence efforts anticipated during construction. Some long-term competition with subsistence fishing harvests is anticipated, if the port attracts increased commercial fishing vessels and activity.

Lost River Mining: Disturbance of reindeer, moose, fish, and small terrestrial mammal habitat is the most likely effect of this project. See Section IV.B.2. for discussions of specific effects on the biological resources. Most villages on the Seward Peninsula now rely on the marine resources of Norton Sound and the northern Bering Sea for most of their livelihood and subsistence. Disturbance to streams and terrestrial habitat, if it affected the viability of these populations on the peninsula, would affect villages dependent on these resources. The villages most likely to be affected by disturbance to Seward Peninsula habitat and resources in the Lost River area are Teller; Brevig Mission; Wales; Nome; Mary's Igloo; and, to a lesser extent, Golovin and White Mountain.

Figure IV.B.1.c.–1



This map depicts approximate locations of summer fish camps of households of Alakanuk, Emmonak, Kotlik, Mountain Village, Sheldon Point, and Stebbins in 1981. The map shows locations where certain households reside for some period of time during the summer of 1981. Not depicted are fish camp locations and seasonal residences of households for other communities such as St. Marys, Pilot Station, Scammon Bay, Unalakleet, and St. Michael. Fish camp locations frequently change from year to year, so the map should not be interpreted as representing a fixed or invariable configuration. Most fish camp locations have not been field checked and should be considered approximate only.

Source: Robert Wolfe, Yukon Delta Sociocultural Systems, S.E.S.P., 1981

State of Alaska Proposed Sale 38: The onshore disturbance, offshore oilspill risk, noise disturbance, population impacts, and competition for subsistence resources by sport hunters and fishermen could occur with this proposed lease sale. Impacts on the Yukon Delta might be most severe, judging from our own oilspill risk analysis for proposed lease sale 57 and the likelihood of persistence of oil in the waterways of the delta region. If spilled oil from this lease sale did persist in the delta for as long as 10 years, effects on Yukon River communities up river could be anticipated as well. Similarly, oilspill or habitat disturbance to Norton Bay resources could indirectly affect a number of local villages dependent upon the marine mammals and fish populations of this bay area. Oilspill or habitat disturbance close to the Unalakleet River might reduce the substantial fisheries resources of this river, utilized by Unalakleet residents as well as residents of Shaktoolik, Koyuk, St. Michael, and Stebbins. These potential disturbances to habitat, population pressure on resources, or potential oilspills could divert or displace local subsistence efforts, adding to the expense of local hunting and fishing harvests. Combined with the presently proposed federal lease sale, the potential risk to subsistence resources of this proposed sale could be significant, particularly in the Yukon Delta area and around Unalakleet.

Calista-AMOCO Exploratory Leasing: Potential habitat disturbance to some subsistence species utilized by residents of the Yukon Delta region could occur over the life of this project, but for the present surface access and geophysical evaluation activities, this disturbance should be relatively minor. See Section IV.B.2. for an evaluation of habitat and resource disturbance effects.

Unavoidable Adverse Impacts: The proposed action would add a number of stresses to a predominantly subsistence-based economy and social system in this region, some of which are unavoidable. OCS development would permanently alter the wilderness characteristics of the region, which itself helps to support a subsistence-dependent lifestyle.

There would be some destruction of habitat and disturbance of ongoing subsistence activities associated with onshore construction at Cape Nome, site of spring sealing and walrus hunting activities for Norton Sound area villages. Some adverse, long-term effects on terrestrial habitat may be unavoidable in the Cape Nome area.

Increased population in the area could create increased competition for subsistence resources, particularly salmon and other fish, moose, ducks, and geese, particularly during development. Accidental predation on local reindeer herds could also be anticipated. Some increased harvest pressure from local residents would also be expected, given increased cash resources, if OCS jobs are made available to local residents. Increased fish and game management would itself be stressful to local residents accustomed to relatively unrestricted use of local resources. Reductions in subsistence take, and increased cash in villages and towns, would affect the sharing of subsistence foods and by-products which, over time, could affect community cohesion.

For those residents of the Nome area who give up a partially or predominantly subsistence lifestyle to work in OCS, or related employment, the transition to an international from an extremely local orientation would be stressful. Families of these workers would also experience disruption and change, as would

organizations or family alliances of which they are a part. (See Holly Record, Copper Center Case Study, 1979; also refer to Sec. IV.B.1.b.)

d. Impacts on Village Livelihood: Local village economies in the Norton Sound-Yukon Delta areas are a mixture of subsistence activities, which include trade and barter of locally available foodstuffs, skins, ivory and other animal by-products as well as cash-producing jobs, crafts, or state and BIA transfer payments of cash. Separating analysis of impacts on village livelihood is, therefore, somewhat artificial since the subsistence-cash interrelationship is itself cyclical--more cash provides the means for expansion of subsistence technology and efforts, while less cash contracts subsistence efforts. Under the present mixed system, effects on the cash economy or on government subsidies have indirect effects on subsistence purchases, since reduced cash affects subsistence effort. Similarly, inflation in prices in Nome would affect prices of village goods brought from Nome, transportation to and from Nome; and available cash reserves to purchase items such as ammunition, fishing nets, and other fishing and hunting supplies needed to successfully provide food for the family. Unlike an urban economic system almost totally based on cash, village systems integrate cash into a much older system. If the cash comes from part-time or seasonal work, or if industry is flexible in its leave requirements for employment, then subsistence activities could still be pursued and village residence as well as family and community cultural values and organization continued. On the other hand, the relatively delicate balance of cash and seasonal subsistence activities could be upset by a radical depletion of key subsistence resources or a radical inflation in the costs of critically needed items such as fuel, medical care, or other basic needs. Under these circumstances, whole villages may be forced to accept outside intervention in the form of food distribution, as in the case of the North Slope caribou herd "crash" of 1976 (Worl, 1980).

As discussed in Section III.B.4., escallating costs of fuel are now becoming a serious drain on village household expenses. Sparck, for example, reports that in the Yukon-Kuskokwim Delta as much as 50 percent of total family income is spent on home heating fuel, compared to about 38 percent in 1975 (based on a household survey in Chevak) (Sparck, n.d.). Recent FY 1982 budget cuts in welfare programs, food stamp assistance, CETA programs and positions, and medical assistance are now beginning to seriously "squeeze" families and villages dependent upon these programs and subsidies. The reductions in cash available for subsistence technology, motor gas, non-subsistence food, clothing and medical care, coupled with fuel price increases, could create serious problems for families without other cash resources either from ivory or other craft sales, fishing, or seasonal construction work.

From the standpoint of subsistence pursuits, reduced cash may force villages to pool resources to minimize cash expenditures per hunt, as well as forego expenditures for new equipment, which itself affects efficiency. If this encourages greater community-wide effort, it could contribute to community cohesion unless cash reductions are so severe that serious health and nutritional deficiencies result. Within this context, however, it is clear that anxieties concerning potential reductions in local resources take on even greater magnitude, perhaps encouraging unrealistic or exaggerated doubts, fears, and concerns.

Village size is one indicator of its viability, both in terms of the relative abundance of local subsistence resources on which villages depend, as well as present cash resources. The largest traditional Eskimo villages were all well located on migration routes of marine mammals, fish, or game, around which their subsistence economy was centered. At the present time, the largest villages near the proposed lease sale area are regional centers (Nome and Unalakleet) or villages which have combined cash and subsistence activities to benefit both--Gambell and Savoonga combine ivory craft sales with sea mammal dependence, and Yukon Delta villages combine commercial and subsistence salmon fishing with harvest of other fish and sea mammals.

The smaller villages in the lease area are located in the inner Norton Sound, primarily from Nome to Golovin Bay but also extending to St. Michael and Stebbins. These villages and roadhouse settlements, because of their proximity to Nome and their relatively small size, are perhaps most vulnerable to further depletion, should the proposed lease sale occur. The depletion could be the result of migration to Nome or Cape Nome of key residents for work, particularly during construction activities, or it could result from the depletion of subsistence resources of the local area due to one or more of a number of factors, including harvest pressure, oilspill contamination, habitat disturbance, or normal biological resource cycles, among others. Resource depletion would probably be more likely for the road-connected villages, including Teller and Brevig Mission, and Solomon which is close to the Cape Nome area.

The combination of factors contributing to a decline of resources on which villages depend, and attraction of key village residents away from their villages to Nome, is likely to occur with the proposed action. Given the small size of these villages, it is likely that at least one or two villages from Nome to Golovin Bay would experience some out-migration, perhaps losing two or three key residents per village (i.e., hunters for the whole village, active fishermen, etc.) at least during the construction period. On the other hand, if families of these workers remain in these villages, the new wages brought back could stimulate the local economies and provide cash for purchase of subsistence technology, encouraging more efficient, effective subsistence outcomes. Additional cash in these villages could also forego somewhat expected inflationary pressures likely to occur for those villages dependent on Nome for supplies and transportation. See Sections IV.B.3.b. and IV.B.1.e. for discussions of Nome economy and infrastructure under the proposal.

For villages more distant from the Nome onshore development, it is likely that few changes directly related to the proposed action would occur, except insofar as subsistence resources are affected or inflation affected costs of supplies purchased through Nome. It is possible that one or more village residents of these more distant villages would migrate to Nome for a period of work, particularly during construction. However, the pattern of seasonal work away from the village in construction activity, and the resulting beneficial cash added back into the village would entail little disruption, and probably a significant benefit of cash, stimulating benefits to the subsistence economy as well.

A more likely disruption to villages from Unalakleet south, but also including Elim, Koyuk, Golovin, and Shaktoolik, is the potential disruption to commercial fishing activities and the risk to commercial fishery resources on which many

villages in Norton Sound and the Yukon Delta depend for their major source of cash. Impacts on salmon resources in particular could have substantial "ripple effects" throughout the Norton Sound region, affecting not only the money income of fishermen, most of whom fish alone in a small boat fishery, but also many families in Elim, Moses Point, Golovin, Emmonak, and Kotlik whose members find work in local canneries. These fishing incomes and wages from cannery work may be the only income these families receive for purchase of heating fuel, gas, and other necessities.

Oil contamination or disturbance of herring or kelp beds on which herring roe are harvested would affect commercial fisheries and the villages dependent on this income, i.e., Stebbins, St. Michael, Unalakleet, Shaktoolik, Golovin, Elim, and Moses Point. (See Graphics Nos. 2A, 2B, and 2C, herring fishery, and harvest maps).

For a further discussion of specific effects on habitat and biological resources in the proposed lease sale area, see Section IV.B.2., Impacts on Biological Resources.

Summary: Local village economies in the Norton Sound-Yukon Delta area combine seasonally patterned subsistence activities and practices (including trade and barter of locally available foods, skins, ivory carvings, and other crafts) with cash from local and out-of-town jobs, state and federal transfer payments, and other sources of cash into a complex survival strategy centered around dependence on local resources and village residence. Reductions in cash or local resources both affect the economic viability of villages forcing shifts in behavior, prosperity, or hardship, depending on the village-wide effects and family-level success at compensating for these changes. Good cash years tend to support subsequently good subsistence harvests since cash used to purchase fuel, ammunition, and fishing gear can be spared from that needed for heating fuel, clothing, and other essential purchases. Average per capita personal income in Norton Sound (Nome CD) was 84 percent of U.S. averages in 1978. Yukon Delta (Wade Hampton CD) average per capita personal income was only 37 percent of U.S. averages. These extremely low standards of living provide little "cushion" in the event of major shifts in federal policies which affect either village-level cash incomes or availability of local resources.

Conclusion: Significant disruptions of village economies throughout the Norton Sound region is possible, although unlikely, with the proposal. Short-term (3-4 years) effects related to peak development activity in the Nome-Cape Nome area could be disruptive to village systems dependent upon Nome for supplies and transportation. Disruption of fishing village economies could also occur, in the event of a major oilspill, but this is not projected as likely.

Effect of Additional Mitigating Measures: Measures mitigating effects on subsistence would also affect village livelihood since village socioeconomic subsistence and cash systems closely combine and mutually benefit both. See the discussion in Section IV.B.1.c., Impacts on Subsistence Patterns.

Cumulative Effects: See the discussion under subsistence, Section IV.B.1.c. Cumulative effects on subsistence and village economies would be substantially the same. Changes in federal programs providing cash in villages could be more substantial in their impacts at the village level than these projects, assuming subsistence resources are only minimally affected. Similarly, inflation in

fuel costs would seriously affect village life above and beyond the effects of these projects.

Unavoidable Adverse Effects: These would not differ from those previously discussed for subsistence. (See Section IV.B.1.c.)

e. Impacts on Urban Infrastructure:

Introduction: Sources of information for the following discussions are: Policy Analysts, Limited (1980); Technical Report No. 53; Institute for Social and Economic Research (1980); Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models.

The following discussion of potential impacts is based on several assumptions. The discussion assumes a mean recoverable resource estimate; assumes onshore facilities for storage, loading, etc.; and assumes an enclave at Cape Nome which would house the majority of onshore workers. Should any of these assumptions vary, i.e., if recoverable resources or the location of find and landfall for onshore operations are different, the impacts discussed in this section could be significantly different.

A complete discussion of the enclave assumptions may be found in Appendix B. A brief summary of potential impacts without the enclave assumption, but assuming the landfall and onshore operations at Cape Nome, may be found at the end of this section.

For a discussion of potential impacts resulting from offshore loading of resources, the reader is referred to Alternative IV, northern deletion (Sec. IV.E.1.e). Potential impacts of Alternative IV, for which offshore loading is assumed, are substantially equal to an offshore loading assumption for this Alternative I (the proposal).

This discussion is based primarily on the population estimates for the Norton Sound region. The reader is referred to Section IV.B.1.a. for a complete discussion of population. In general, Nome would see some slight growth resulting from this proposal during 1983-1984. The period beginning 1985-1986 and continuing until 1990-1991 would see significant community expansion, primarily related to facilities construction, the peak of which is 1988. In 1992-1993, there is a reduction in construction work force with an attendant population reduction and stablization of production work force through the year 2000.

Housing and Residential Land Use: The demand for additional housing units and related residential land-use requirements are derived as a function of population.

The demand for housing units begins with the inception of exploration in 1983 (see Table IV.B.1.e.-1). In 1985, demand for additional housing would rapidly escalate, peaking in 1988. The demand for housing units in 1988 is 1,023 more than is the forecast requirement in the no sale case (Alternative II).

After the 1988 peak demand, housing unit requirements would diminish as the population decreases to relative stability in 1997. At that point, only 141 additional housing units are required over the no sale requirements.

Table IV.B.1.e.-1

Forecast of Change in Demand for Housing and Residential Land

Year	Alternative I[a] (Proposal) Cumulative Housing Demand (Dwelling Units)	Alternative I[a] (Proposal) Cumulative[b] Land Demand in Nome (Acres)	Alternative I[a] (Proposal) Cumulative[b] Land Demand Outside (Acres)	Alternative II (No Sale) Cumulative Housing Demand (Dwelling Units)	Alternative II (No Sale) Cumulative[b] Land Demand in Nome (Acres)	Alternative II (No Sale) Cumulative[b] Land Demand Outside (Acres)	Alternative IV[a] (Northern Deletion) Cumulative Housing Demand (Dwelling Units)	Alternative IV[a] (Northern Deletion) Cumulative[b] Land Demand in Nome (Acres)	Alternative IV[a] (Northern Deletion) Cumulative[b] Land Demand Outside (Acres)
1983	74	12	24	18	3	6	27	5	9
1984	144	24	46	36	6	12	59	10	19
1985	358	58	114	55	9	18	174	28	56
1986	523	85	167	75	12	24	264	43	85
1987	771	125	246	95	16	31	314	51	100
1988	1,023	165	326	116	19	37	384	62	123
1989	889	144	284	137	22	44	368	60	118
1990	547	89	175	158	26	51	322	52	103
1991	322	52	103	163	27	52	214	35	69
1992	224	37	72	168	28	54	182	30	58
1993	185	30	59	174	29	56	172	28	55
1994	173	28	55	179	29	57	158	26	51
1995	166	27	53	185	30	59	123	20	40
1996	158	26	51	191	31	61	119	20	38
1997	141	23	45	196	32	63	120	20	38
1998	140	23	45	202	33	65	133	22	43
1999	141	23	45	208	34	67	130	22	42
2000	140	23	45	214	35	69	116	20	37

a. Required in addition to Alternative II.

b. Based on 6.2 housing units per acre (exclusive of rights-of-way) within the Nome city limits, and 3.14 housing units per acre (including rights-of-way) outside the Nome city limits.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Residential land requirements coincide with the demand for housing units. Utilizing existing land use patterns to determine the formula of 6.2 housing units per acre (exclusive of rights-of-way) within the Nome city limits, and 3.14 housing units per acre (including rights-of-way) outside the Nome city limits, the demand for additional residential land ranges from 165 acres within the city to 326 acres outside the city.

As discussed in Section III.B.5., the Description of the Affected Environment, Nome currently experiences a severe shortage of suitable housing and developable land. Many of Nome's residents live in substandard housing units. The effect of this increased demand can only further aggravate the existing problems by inflating rents. Low-income families may be forced either to make greater use of substandard units or move out of the Nome area. It can be anticipated that some indigenous village populations would relocate in their native villages (Sec. IV.B.1.c.). This, in turn, may have repercussions on the housing stocks in these villages.

The city itself has been reluctant to participate in government-financed housing. Combining this reluctance with the reluctance of private individuals to begin development in advance of actual demand will serve to create an even greater housing shortage.

With housing demand peaking in 1988 at an additional 1,023 units, and then declining to only 140 in 1997, financing for housing construction would be difficult to obtain to meet peak forecasts. With the potential existing for a surplus of 882 units by 1997, financiers and developers may be very reluctant to build far more than the anticipated, long-range needs. Assuming this lack of participation, Nome would begin to experience a shortage of housing units in 1984 which becomes critically severe in the peak years.

The lack of residential lots in Nome is currently a problem, and growth caused by OCS development would compound it. Future building sites must come from privately owned, undeveloped land, both within and outside of Nome, as well as city owned lots within Nome. One method for obtaining building sites to meet housing needs during peak years of demand is proposed in the Nome Coastal Management Plan (ESL, 1981b). This alternative combines the needs of Alaska Gold Co. to reserve their property for future mining with the current need for short-term housing needs. The policy recommends that temporary energy-efficient modular housing could be located on leased lots in unmined areas near the city where mining is unlikely in the next 10 to 20 years.

Much of the undeveloped land within Nome is inaccessible due to a lack of roads. The drainage project will not make sufficient land available to meet the demand. Lack of water and sewer services presents another problem.

The forecasted residential land requirements (see Table IV.B.1.e.-1) and the problems associated with meeting this demand within the city limits would probably force construction out of the city. Services to these new residences would present a problem. Water and sewer are currently hauled back and forth to development outside the city, a less than desirable arrangement. Serving hundreds of homes in this manner could cause untold problems.

Utilities: Per capita water consumption is estimated at 303 lpcpd (80 gpcpd). For purposes of this forecast, it is assumed that all residences would be

receiving piped water services, although currently only about half of the community receives piped water. Demand for water increases in this case with peak demand in 1988 (see Table IV.B.1.e.-2). Nome's present water source may be strained during this peak demand period. Additionally, ideal storage capacity should be a 3-day reserve. Nome currently has only a 1.5-day reserve. A proposed new storage facility should be adequate.

Waste water generation closely approximates water consumption. The present sewage treatment system is inadequate at this time. A proposed new facility would accommodate much of the forecast needs, but may prove to be inadequate during the peak years.

Total electrical generation for Nome is presently 8,350 kilowatts. This capacity would only accommodate OCS growth until 1984 (see Table IV.B.1.e.-3). In addition, due to a short-term surplus anticipated by the city, several of the smaller generators would probably be retired. The overall implication of development in this case is that prior to OCS development, generating capacity would have to be significantly increased.

The present telephone switching system can accommodate an additional 200 main stations. This essentially means that as early as 1 year after the proposed lease sale, the switching system would have to expand, probably requiring a move to solid state switching equipment at that time.

Public Safety: Using the standard of one sworn officer per 500 people added to the population, additional officers would have to be added to the force in the early 1980's (see Table IV.B.1.e.-4). At the peak in 1988, as many as seven additional officers may be required.

Detention facility requirements dictate a ratio of one jail cell per 500 in the population. At the peak impact in 1988, as many as seven additional cells may be required (see Table IV.B.1.e.-5).

To accommodate OCS demand, Nome's water distribution system, at a minimum, should be capable of pumping in excess of 800 gallons per minute to meet normal water-use rates and minimum fire-flow requirements (see Table IV.B.1.e.-6). Presently, the system's capacity is 650 gallons per minute indicating a deficiency as early as 1 year after the sale. Furthermore, the above fire-flow standard is not considered sufficient to accommodate fire-flow needs for large structures such as hospitals or schools. To ensure adequate fire protection to the community, Nome would need to upgrade its pumping capability in advance.

Education: To maintain the current student-teacher and student-classroom ratios, additional students added to the system due to OCS development would require increased manpower and facilities (see Table IV.B.1.e.-7). Significant increases would begin shortly after the proposed lease sale and peak in the late 1980's. With the decline in population after the peak, student enrollment would begin to decline.

If the school system expanded to meet peak requirements, there would be a surplus of instructional staff and facilities. If the school system chose not to maintain current standards during peak requirements, the ratios could be allowed to rise. Even with this possibility, the ratios would probably not exceed standards for urban communities in Alaska.

Table IV.B.1.e.-2

WATER CONSUMPTION[a]

Year	Alternative I[b] l.p.d. (millions)	Alternative I[b] g.p.d.	Alternative II l.p.d. (millions)	Alternative II g.p.d.	Alternative IV[b] l.p.d. (millions)	Alternative IV[b] g.p.d.
1985	.33	88,400	1.0	276,080	.16	42,880
1990	.50	135,680	1.2	304,800	.30	79,440
1995	.15	40,800	1.2	312,400	.15	30,240
2000	.13	34,240	1.2	320,400	.11	28,560

a. Based on 80 gallons per capita per day and assuming all housing receiving piped water.

b. Required in addition to Alternative II.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Table IV.B.1.e.-3

ELECTRIC DEMAND[a]

Year	Alternative I (in KW)[b]	Alternative II (in KW)	Alternative IV (in KW)[a]
1985	2,763	6,902	1,340
1990	4,240	7,620	2,483
1995	1,275	7,810	945
2000	1,070	8,010	893

a. Assumes a demand of 2.0 KW per capita load for Alternative II population and a 2.5 KW per capita load for OCS population.

b. Required load in addition to Alternative II requirements.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Table IV.B.1.e.-4

POLICE MANPOWER REQUIREMENTS[a]

Year	Alternative I Number of Additional Officers Required[b]	Alternative II Number of Sworn Officers Required	Alternative IV Number of Additional Officers Required[b]
1985	3	10	2
1990	4	11	2
1995	1	11	1
2000	1	11	1

a. Ratio of one sworn officer per 500 population.

b. Required in addition to Alternative II.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Table IV.B.1.e.-5

DETENTION FACILITY REQUIREMENTS[a]

	Alternative I Number of Additional Cells Required[b]	Alternative II Number of Cells Required	Alternative IV Number of Additional Cells Required[b]
1985	3	14	1
1990	4	15	2
1995	1	16	1
2000	1	16	1

a. Ratio of one jail cell per 500 population.

b. Additional cells required over Alternative II.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Table IV.B.1.e.-6

MINIMUM FIRE FLOW REQUIREMENTS[a]

Year	Alternative I Total Pumping Capability Required (g.p.m.)	Alternative II Total Pumping Capability Required (g.p.m.)	Alternative IV Total Pumping Capability Required (g.p.m.)
1985	753	692	722
1990	805	712	767
1995	745	717	738
2000	746	723	742

a. Based on minimum community water-flow requirements plus 500 gallons per minute for fire suppression.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Table IV.B.1.e.-7

PROJECTON OF PRIMARY AND SECONDARY SCHOOL MANPOWER AND FACILITIES REQUIREMENTS

	Alternative I			Alternative II			Alternative IV		
Year	Additional Student Population	Additional[a] Teachers	Additional[b] Classrooms	Student Population	Number of Teachers	Number of Classrooms	Additional Student Population	Additional[a] Teachers	Additional[b] Classrooms
1985	221	17	15	883	68	61	107	8	7
1990	339	26	23	918	71	63	199	15	14
1995	102	8	7	937	72	65	76	6	5
2000	86	7	6	961	74	66	71	5	5

a. This is the number of additional teachers required over Alternative II to maintain a 13:1 student/teacher ratio.

b. This is the number of additional classrooms required over Alternative II to maintain a 14.5:1 student/classroom ratio.

Sources: Alaska OCS Office (1980); Policy Analysts, Ltd. (1981).

Table IV.B.1.e.-8

ADDITIONAL ACUTE CARE BED AND PRIMARY CARE PHYSICIAN NEED[a]

	Alternative I[b]		Alternative II		Alternative IV[b]	
Year	Acute Care Beds[c]	Primary Care Physicians[d]	Acute Care Beds	Primary Care Physicians	Acute Care Beds[c]	Primary Care Physicians[d]
1983	2	1	21	4	1	1
1984	2	1	22	4	1	1
1985	4	1	22	4	2	1
1986	6	2	22	4	3	1
1987	9	2	23	4	4	1
1988	12	3	23	4	5	1
1989	10	2	24	4	4	1
1990	6	2	24	4	4	1
1991	4	1	24	4	3	1
1992	3	1	25	4	2	1
1993	2	1	25	4	2	1
1994	2	1	26	4	2	1
1995	2	1	26	4	2	1
1996	2	1	26	4	2	1
1997	2	1	27	4	2	1
1998	2	1	2	4	2	1
1999	2	1	2	5	2	1
2000	2	1	28	5	2	1

a. Regional forecast.
b. These forecasts are requirements in addition to Alternative II.
c. Ratio 3.5 beds per 1000 additional residents.
d. Ratio of 1 primary care physician per 1500 additional residents.

Sources: Alaska OCS Office (1981); Policy Analysts, Ltd. (1980).

Health Care: Applying the ratio of 3.5 acute-care beds per 1,000 additional residents in the region and one physician per 1,500 additional residents, Table IV.B.1.e.-8 projects the added beds and physicians required. The present hospital beds would be strained with OCS development. While some temporary beds may ease the situation, additional beds would be required at the peak demand.

Physician services would also become somewhat strained. At the peak in 1988, three physicians more than the no sale alternative would be required. Associated with these increased requirements is the increased demand for other health services personnel. Nome has experienced a high turnover rate with such professionals, and this continuing problem would be aggravated with OCS activity.

Public Revenues: Nome currently raises, from all sources, approximately $624 per resident and spends a like amount. This figure is likely to rise somewhat as a result of additional sales-tax revenues generated from spending in Nome by transient employees of OCS development, both onshore and offshore.

Short of additional revenue generated by an increase in state or federal aid, or the willingness of Nome's residents to increase their own mill levy, Nome would likely find itself sorely in need of finances. Recent attempts by the city to annex Cape Nome, in hopes of capturing the potential tax base an OCS onshore facility might provide, have failed. (See Appendix B.) Successful efforts to annex any onshore facilities could seriously affect the city's financing capacity.

The city has many serious shortcomings in its public utilities. Piped water and sewer is not provided to half of the community. The current sewage treatment system is inadequate. The water storage system currently needs upgrading and the fire suppression systems are not adequate. These current problems would be compounded by OCS development.

Without additional revenues, the city would be unable to maintain its present service levels. The city does not now have excess funds to increase its bonding for expansion of services, making expansion of services to meet OCS demands impossible. Services to the areas contiguous to the city are nonexistent, and without financing for these areas such services would also be impossible to provide.

Non-Enclave Assumption: As stated earlier, the previous discussion has been based on the assumption that many of the onshore workers would be housed in an enclave at Cape Nome, the hypothetical site of the pipeline landfall and onshore facilities.

The likelihood does exist that the onshore facilities could be located at Cape Nome, but without benefit of an enclave arrangement for housing workers. Under this scenario, it is possible that onshore workers would have to reside in or around Nome.

The impacts of such a scenario are tremendous. In addition to the forecasts under the enclave assumption, as many as 1,000 onshore workers could be resident in Nome at any given time. These additional residents would generate

additional employment in the community, all of which would combine to create an additional population increase substantially larger than just the number of direct OCS employees.

Such an increase would seem to further aggravate the impacts detailed under the previous enclave assumption. The entire infrastructure of Nome could well be overwhelmed by such an increase. An already difficult situation in the housing and residential lands situation would become significantly worse. Utilities and services would probably be wholly inadequate, and the community would most likely be unable to finance anywhere near the service level demands.

Summary: Housing would be a critical problem in the Nome area, even given the assumption of an enclave at Cape Nome to house the majority of onshore workers. Housing needs would begin to escalate in 1985 and peak in 1988 with 1,023 more housing units needed than would otherwise be required in Nome. Following a gradual decline, housing requirements would stabilize in 1997 at approximately 140 dwellings, leaving 883 surplus units in 2000.

Three factors aggravate the problems associated with meeting these housing impacts; a lack of building sites within the townsite and difficulty purchasing lands outside the town site due to the reluctance of a major landholder, Alaska Gold Co., to sell its land; lack of access roads to undeveloped lands; and a lack of water and sewer service to residences outside the townsite. As a result of this severe housing problem, the cost of new housing may be inflated. Housing shortages and high development costs may lead to increased rents in the existing housing stock, possibly forcing low income residents into dilapidated housing units or out of the Nome area.

A possible solution to lack of lands available for purchase and the temporary nature of the housing needs was proposed in the Nome draft Coastal Management Plan. Modular homes could be placed on lots leased from Alaska Gold Co. for a 10- to 20-year period. After the lease is terminated, the housing units would be removed and the land available for mining.

Other local services will also be affected. These effects, however, are either less severe or more tractable. For example, water supplies and sewage treatment facilities may be strained or their capacity exceeded during peak years. Electric supplies and the telephone system will be totally inadequate. Facilities and personnel necessary for health care and public safety will need to be expanded to meet peak requirements. Current student/teacher and student/classroom ratios will probably increase rather than add personnel or facilities which will be surplus after peak years.

Current levels of local revenues in Nome would be insufficient for Nome to maintain present level of service. Expansion of these services to areas outside but contiguous to the city limits will not be possible without other sources of revenue.

If an enclave arrangement for housing workers does not occur, it is possible that onshore workers would have to reside in or around Nome. This event could overwhelm the entire infrastructure of Nome and create exteme housing and public service problems.

Conclusion: In the short-term (1983-1988), Nome would experience an extreme housing shortage (approximately 1,000 units by 1988) as a result of the proposed lease sale and the attendant assumptions. Servicing new homes with water and sewer service also would be a major problem since homes outside the townsite limits rely on these services to be delivered or removed by truck. Inflated costs associated with the housing shortages could force low-income residents into dilapidated housing or out of the Nome area. New telephone circuitry and increased water flow for fire fighting will be required immediately. Needs for police, teachers, and health care personnel, detention facilities, classrooms, and hospital beds will be especially critical during peak years of development (1988-1989). Longer term impacts may center around surplus dwellings (approximately 800 units in 2000), and service facilities between industry personnel and displaced residents.

Effect of Additional Mitigating Measures: Should Section 308 (Coastal Energy Impact Program) of the Coastal Zone Management Act be reauthorized, the funds could be utilized by the community to assist in providing certain public services which the community might otherwise be unable to finance.

Relief from inflated rents could be provided by Alaska Statutes, Chapter 06, Emergency Residential Rent Regulation and Control Area. This statute establishes authority for the Governor of Alaska to issue a proclamation of housing emergency for any part of the state. During a housing emergency, no landlord within the geographic area covered by the proclamation may raise housing rents or evict a tenant in violation of regulations established by the Commissioner of the Alaska Department of Commerce under provisions of AS 34.06.

Cumulative Effects: The Port of Nome Deepwater Terminal; the Lost River Mining Project; and, to a lesser degree, State of Alaska proposed sale 38, would all impact Nome. The cumulative effect of these projects, when combined with the proposed lease sale, increases the severity of the impact on Nome's infrastructure by increasing population and the attendant increased demands for housing and public services.

Unavoidable Adverse Effects: An extreme housing shortage would cause inflated housing costs and the community would be unable to provide public utilities to many new housing units. The community would most likely be unable to finance the increased public-service demands resulting from the proposed lease sale.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat: The importance of the Delta's biological resources, and of the Delta's subsistence economy, were described previously in Sections III.B.3. and III.C.1. The present section assesses the effects on the Delta's resources from three factors that are possibly associated with the proposed leasing: an influx of industry personnel into the Delta, construction of artificial islands and support facilities for exploration and development of an oil field, and accidental oilspills.

The size of the influx of industry personnel is described in Section IV.B.1.a. (Impacts on Population). If no oil resources are discovered, and there is only an exploration phase, about 300 people are expected to move into the Nome region. If the oil and gas resources are discovered, initially about 1,000 and eventually about 3,000 industry personnel may move into the Nome region.

Portions of this group may make infrequent sport hunting and fishing trips to the Yukon River Delta. They could have some effect on the abundance of biological resources upon which the Delta residents are dependent for their subsistence (see also Sec. IV.B.1.c.). However, this impact would not be noticeable.

Offshore construction for exploration near the Delta would probably include artificial islands because of the shallow depths. (There are only 5-12 meters of water in the southeast portion of the proposed lease area near the Delta.) However, the dredging for artificial islands would probably affect very few benthic species because of the low biological diversity on the Delta's ice-scoured, submarine plain (Feder and Jewett, 1978; O'Clair, 1981).

Location of a shore facility near the Delta is unlikely because of the impracticality of harbor siting anywhere in the area. However, it should be re-emphasized that any shore construction would cause definite changes, not merely in the biological sense (competition for Native subsistence resources), but also in the sense of physical disruption (dredging, filling, construction activities, etc.). The degree of change would depend on the type of shore facility and its location.

Accidental oilspills are the third factor associated with the proposed leasing that may affect the Delta. The Oilspill Risk Analysis (Sec. IV.A.4.) indicates that there is a 2-percent probability, derived by combining land segments 2-5), that a spill of 1,000 barrels or greater would contact any portion of the Delta coastline within 10 days using the onshore transportation scenario (Appendix J, Table 15). Under the offshore transportation scenario (Appendix J, Table 16) these risks would be 7 percent and 3 percent for 1,000 and 10,000 barrels, respectively, within 10 days. These relatively low oilspill-risk probabilities are partly because of the low resource estimates for the area. However, even by assuming that an oilspill would occur, the probabilities of contact with the Delta would not exceed 7 percent (Appendix J, Tables 4, 5, and 6).

Other factors which may influence the oilspill risk to the Delta are the nearshore entrainment processes, which are described in Section III.C.1. Nearshore tidal flow by the Delta may entrain spills that pass several kilometers off the Delta. Also, local wind-induced shoreward flow, or diurnal sea breezes, may move nearshore oil slicks into the Delta. The Delta's shallow geomorphology and the suspended sediment in the nearshore water may cause spilled oil to sink, as it did after the Amoco Cadiz tanker oilspill. Oil entrained in the bottom sediments may have long-term effects on the benthic community in these areas. However, because these communities off the Delta are relatively impoverished, no significant food-chain interactions are expected. The subsurface oil could be carried upstream in river channels by the subsurface estuarine circulation, even against the surface outflow. Finally, sea ice borders the Delta in the winter (Fig. III.C.1.-2.). Sub-ice channels and tidal cracks may allow some of the oil to rapidly surge through the ice buffer to the Delta. However, the ice would absorb much spilled oil, as it did after the Kurdistan tanker oilspill and Buzzards Bay oilspill.

Due to the complicated nearshore entrainment processes, spills that drift within 10 kilometers of the Delta during summer may become entrained in the Delta. The Oilspill Risk Analysis calculates the probability that a hypothetical oilspill would drift into this 10-kilometer-wide nearshore zone off the

Yukon River Delta during the ice-free summer season (Appendix J, Tables 7 and 8). The probability that an oilspill of 1,000 barrels or greater contacting this area within 3, 10, or 30 days is less than 0.5 percent, 11 percent, and 13 percent, respectively (less than 0.5, 5, and 6 percent, respectively, for spills exceeding 10,000 barrels), using the onshore transportation scenario (Appendix J, Table 7). Using the offshore transportation scenario (Appendix J, Table 8), these figures increase slightly. This oilspill risk to the Yukon River Delta is due almost entirely to hypothetical spill locations within the southeast corner of the proposed lease area (refer to Appendix J, Tables 1 and 2).

Even though the chance of impact is quite low, the consequences of an oilspill that contacts the Delta would be serious. Around the edge of the Delta are areas where tens of thousands of shorebirds and waterfowl seek food and shelter (see Sec. III.C.3.). All of the Delta shoreline is rated class 8, or greater, on the Coastal Oilspill Vulnerability Index, which means that spilled oil may persist for 5 to 10 years (Gundlack et al., 1981). Because of the subarctic climate, rates of biological degradation of oil around the Delta are believed to be very slow. Evidence is subjective--beached fish often dehydrate and become mummified before they decompose--but it implies tremendous persistence of any oil on the Delta (Jones, pers. comm., 1980). Also, the peaty substrate of much of the Delta is judged as likely to bind oil for a long time (Trasky, pers. comm., 1980). If not degraded, slow leaching from the organic debris would cause long-term, chronic release of the oil. Natural storm surges, which occur several times a year, raise the water level over much of the Delta. The storm surges may transport spilled oil into the higher marsh surfaces and farther upstream, potentially affecting birds and fish away from the edge of the Delta (refer to Sec. IV.B.2.c. and IV.B.2.6.). However, the coincidence of a storm surge and oilspill occurring during the same period has an even lower probability than those stated above.

One mitigating effect on oilspills is the oilspill response capability of the oil industry and of the U.S. Coast Guard. Oilspill cleanup responses are described in Section IV.A.6. The absence of roads and the shallow nearshore shoal make it difficult to deploy oilspill cleanup equipment. Further, heavy cleanup equipment on the soft Delta substrate may do more damage than the spill itself.

Another mitigating effect is provided by Offshore Oil Pollution Compensation Fund. Claims for losses arising from offshore oil pollution may be made for loss of profits or for "loss of use of natural resources," which should cover both commercial and subsistence use of the Delta's birds and fish.

Conclusion: Should a large oilspill contact the Delta simultaneously with a storm-surge event, oil could be driven inland onto higher marsh surfaces where it could persist for 5 to 10 years with resultant long-term (chronic) effects on the biota (principally waterfowl and fish) of these marsh habitats. The effects would more likely be local and are not anticipated to result in regional impacts. The intensity of these effects would depend on the size and location of the affected area. The likelihood of such an event is considered very low because of the unusal set of circumstances that would have to occur simultaneously by chance.

Effect of Additional Mitigating Measures: Impacts of OCS activities on biological resources used for subsistence in the Yukon River Delta could be further reduced by a proposed Information to Lessees on Subsistence Activities (Sec. II.B.1.c.). Distant siting of shore facilities during the development phase and the types of possible enclaves (see Appendix B) would also have a mitigating effect on the important subsistence resources in the Yukon River Delta.

The Norton Sound Synthesis Meeting discussed several strategies to mitigate oilspill impacts on the Yukon River Delta region. The meeting group concluded:

> "That an oilspill contingency study group should be convened, with the cooperation of the BLM, the USGS, the USCG and EPA, to analyze the possible desirability of using dispersants on any sizable oilspill in the region, and to define conditions so that dispersants could be deployed in time to minimize damage to the biota of the northeast Bering Sea. . . . We emphasize that cleanup in the Delta may be impossible, oil residence times on the Delta are likely to be many years, and that reaction time in an emergency must be short."

The synthesis meeting also noted that the erratic, but fairly frequent, flooding of the Yukon River Delta by storm surges provides a mechanism for transporting oil further inland. Therefore, the synthesis meeting group suggested that a storm-surge model be developed for the northeastern Bering Sea. The storm surge model could be used to predict the occurrence of storm surges, such as the hurricane warning system used in the Gulf of Mexico. Partly in response to the suggestion, a research project was recently initiated at the Arctic Environmental Information and Data Center (AEIDC) to develop a storm surge model for the area (J. Wise, AEIDC, personal communication, 1980). An additional level of oilspill response is provided by the proposed Information to Lessee on Oilspill Contingency Plans (Sec. II.B.1.c.).

Aside from additional responses to an oilspill, the overall risk of oilspills near the Delta could be reduced by the relocation of facilities which pose significant oilspill risks. Some petroleum facilities do not have to be located in the region near the Delta (although drilling platforms and possibly production pipelines, of course, must be located there in order to explore and produce the region). Non-site-specific facilities, such as oil-loading, tankering, and storage facilities, could be located in areas that pose less risk to the Delta. Also, the non-site-specific facilities, such as tankers, pose a much greater oilspill risk than the site-specific facilities such as offshore platforms. After discussing this problem, the Norton Sound Synthesis Meeting group concluded that tankers should be routed away from the Yukon River Delta, or midway between the Delta and St. Lawrence Island, and that no support, loading, storage, or transfer facilities should be permitted on the Delta or within 60 kilometers of its shore. The first conclusion relates to a problem that would be resolved by the U.S. Coast Guard with traffic fairways, when and if tankers are used to transport produced oil. The Oilspill Risk Analysis shows that tanker routes half-way between the Delta and St. Lawrence Island pose essentially no oilspill risk to the Delta. (See Sec. II.B.1.c. and Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities.)

The second conclusion, about ways to reduce oilspill risks to the Delta, forms the basis of a special mitigating measure, which it is described in Section II.B.1.c. (Measure for Area of Special Concern).

Cumulative Effects: Aside from the effects on the Yukon River Delta due to the proposed offshore lease sale, similar effects may result from possible State of Alaska and private oil lease sales in and near the Delta (Sec. IV.A.8.). Because the latter sales are actually closer to or in the Delta, they pose greater risks. If the mitigating measures that were described in the previous section are applied to all of the leasing (whether federal, state, or private), the cumulative effects should be minimal.

Unavoidable Adverse Effects: The only long-term, adverse effect on the biological resources of the Yukon River Delta that may remain after the project, in spite of any mitigating measures, is the long-term effect of oilspills. Spilled oil may persist in the Yukon River Delta sediments for up to 10 years after an accident and affect the local biota.

b. Impacts on Fish Resources: Table IV.B.2.b.-1 summarizes the potential impacts of oil and gas development on the major fin and shellfish species of the Norton Basin, including life-stage analysis. Generally, the greatest danger to both groups would occur from an oilspill reaching nearshore areas during the summer or ice-free season.

Forage Fish: The Pacific herring is possibly the most important fish species in the Norton Basin for use by man and as a forage fish consumed by other fish, birds, and mammals. The Pacific herring would also be the species most vulnerable to any adverse impact from oil and gas development. This risk would be greatest during the time of herring spawning (June-July) when adult herring concentrate nearshore in specific spawning habitats (refer to Fig. III.C.2.-4). Eggs are generally deposited on kelp or eelgrass and hatch within a month. Larvae remain in nearshore waters for up to 2 months. Upon changing into juveniles, herring begin to school and gradually move offshore.

Assuming either the onshore or offshore transportation scenario of 1,000 barrels or larger, the probabilities are unlikely that an oilspill would contact any of the herring spawning areas (depicted in Fig. III.C.2.-4) within 10 days during the time of their greatest vulnerability range from 0 to 9 percent. A majority of these probabilities (land segments 8 through 18) occur at or below 1 percent. The probabilities that a large spill (10,000 barrels or greater) would occur is even smaller (refer to probabilities for land segments 9-21, Appendix J, Tables 15 and 16). Therefore, it is reasonable to conclude that it is very unlikely that herring spawning areas would be contacted by an oilspill during the life of filed.

If an oilspill did contact one of the spawning areas during the spawning or larval rearing period, it is possible that adverse consequences to the local herring population could occur. These consequences could include egg or larval mortalities, contamination of spawning substrate, loss of organisms upon which larval herring feed, and adult mortalities. It is possible that a year class from the impacted area could be lost as a result of this impact. The extent of these losses would depend on many factors, with the size of spill and size of the affected area being the greatest determinants. It is also possible that only a portion of the spawning population, eggs, or larval herring would be

Table IV.B.2.b.-1
Norton Basin Major Fish Species
Potential Oilspill Interactions Analysis

Species	Habitats			Impact Potential	
	Adult	Eggs	Larvae/Immature	Season	Type
Cods and Flatfish					
Saffron Cod	Demersal	Pelagic	Pelagic	Winter	Toxic to eggs and larvae, probable avoidance reaction by adults
Arctic Cod	Demersal	Pelagic	Pelagic	Winter	Toxic to eggs and larvae
Starry Flounder	Demersal	Pelagic	Pelagic	Winter/ Summer	Toxic to eggs and larvae; reduction in food supply; behavioral reaction
Yellowfin Sole	Demersal	Pelagic	Pelagic	Winter/ Summer	Toxic to eggs and larvae; reduction in food supply; avoidance reaction
Forage Fish					
Pacific Herring	Pelagic	Demersal (attached to vegetation)	Pelagic	May/June	Toxic to eggs and larvae, contamination of spawning substrate
Toothed Smelt	Pelagic	Demersal	Pelagic	Fall	Possible interference with migration
Capeline	Pelagic	Demersal/ attached to gravel on beach or bottom	Possibly Pelagic	June/August	Toxic to eggs and larvae, contamination of spawning substrate
Pacific Sand Lance	Demersal	Demersal	Palegic/Demersal	Year round	Toxic to eggs and Larvae

Table IV.B.2.b.-1
Norton Basin Major Fish Species
Potential Oilspill Interactions Analysis
(continued)

Species	Habitats			Impact Potential	
	Adult	Eggs	Larvae/Immature	Season	Type
Salmonids					
Chum Salmon	Pelagic	Not Present	Pelagic	Summer	Possible interference with migration patterns
Pink Salmon	Pelagic	Some Inter-tidal Demersal	Pelagic	Summer	Possible interference with migration patterns; toxic to eggs and larvae
Coho Salmon	Pelagic	Not Present	Pelagic	Summer/ Fall	Possible interference with migration patterns
Chinook Salmon	Pelagic	Not Present	Pelagic	Summer	Possible interference with migration patterns
Arctic Char	Pelagic	Not Present	Pelagic	Summer	Reduction in food, interference with migration patterns
Other					
Inconnu	Pelagic	Not Present	Pelagic	Summer	Reduction in food; interference with migration patterns
White Fish	Pelagic	Not Present	Pelagic	Summer	Reduction in food; interference with migration patterns
King Crab	Demersal	Demersal (attached to adult female)	Pelagic	Summer	Toxic to eggs, larval, and juve-niles

affected in a given area. Given that extreme environmental conditions (i.e., shortage of food supply, storms, etc.) cause extremely high egg and larval mortality (as high as 99-percent for larvae and 60- to 90-percent for eggs (Smith, 1976)), the loss attributable to an oilspill could be extremely small. Even in the worst case, however, the loss of a local year class would not represent a significant regional impact to the total Norton Sound herring biomass. This could, however, be a significant regional impact to local residents who harvest herring or herring roe for subsistence purposes.

Capelin, another forage species, would have a greater probability of being impacted by oilspills than herring. Oilspill risk analysis probabilities for 1,000 barrel or greater spills within a 10-day period are 18 and 11 percent, respectively, for the onshore and offshore transportation scenarios. Larger spills (10,000 barrels or greater) are expected to be lower at 9 and 4 percent, respectively. These probabilities have been calculated by combining probabilities for land segments 21 through 23, which have been identified as capelin spawning areas (refer to Fig. III.C.2.-4. and IV.A.4.C.-2). The consequences of oil contacting these spawning areas would be similar to those for herring.

Other forage species which could be affected include toothed smelt and sand lance. Impacts to these species would be similar to those for herring.

Salmonids: Oilspill contamination appears to be the only causal agent that poses a threat to the salmonid species in this area. Adult salmon (of all five species) would be vulnerable to oil contamination if a spill contacted areas in or near the mouths of rivers during or preceeding periods when these fish are congegating near these river mouths prior to migrating up river to spawn. Smolt would be susceptable to adverse impacts in the same areas during out-migration or in nearshore areas during their first few months in the marine environment. Pink salmon would be vulnerable during all life stages as this species spawns intertidally to some degree.

When considering the onshore transportation scenario (Appendix J, Table 15), probabilities that oilspills would contact certain river mouths around the Yukon River Delta and inner Norton Sound appear to be very low. The oilspill risk analysis indicates that the probability of an oilspill of any size contacting any land segment along the Yukon River Delta or inner Norton Sound (from the Yukon to Golovin Bay) is 1 percent or less within 10 days of the spill. This would increase to 2 percent or less around the Yukon River and 5 percent or less in inner Norton Sound within 30 days. Even though there is a slight increase in oilspill risk, the increase in time (to 30 days) would allow for weathering and degradation of the oil and quite possibly some clean-up efforts, thus reducing the potential for adverse consequences. Areas with higher potential for oilspill risk are those river mouths located west of Golovin Bay to Cape Wooley (OSRA land segments 19-23). Probabilities (within 10 days) for these segments would be 9 percent or less for spills of 1,000 barrels or greater and 4 percent or less for spills of 10,000 barrels or greater.

Under the offshore transportation scenario (Appendix J, Table 16), a reduction in oilspill risk is observed for the land segments west of Golovin Bay and a slight increase from 1- to 5-percent (for a 1,000 barrel spill within 10 days) is observed in only one segment (segment 3) around the Yukon Delta. This in-

crease would probably result from offshore loading and tankering in the southern portion of the lease area. However, these probabilities remain extremely low under this scenario.

While all five Pacific salmon species would be vulnerable to oilspill impacts during the entire ice-free period, vulnerability to each species in the adult stage would vary by period of spawning run and by location. In most instances oilspill risks to a specific species may be reduced from those stated above. For example, king salmon begin to appear off the Yukon Delta in mid-May with the run ending around mid-July. This 2-month period represents only a portion of the time that oilspill trajectories could contact targets around the Delta. Therefore, the probabilities that king salmon adults returning to spawn could be adversely affected is somewhat less than the already low probabilities presented above.

If it is assumed that an oilspill contacts a nearshore area, especially off the mouth of a major salmon river, several impacts could occur. These impacts could be any of a variety of lethal or sublethal toxic responses, or the loss of fish prey organisms. Adult salmon are highly mobile, and some evidence suggests that this life stage could detect and avoid toxic levels of aromatic hydrocarbons in solution (Weber et. al., 1981). Therefore, the major concern seems to be that these adults would avoid areas of contamination, which if found off the mouths of major spawning rivers could result in delays in spawning runs or actual blockage of the river or stream. Given the fact that oilspills in the marine environment generally result in concentrations less than those which have proven toxic to adult salmon (Malins, 1977), it is quite unlikely that this type of impact would occur. Even if toxic concentrations did occur, these concentrations would not remain long in marine waters, especially off the mouth of major rivers where dilution would occur rapidly.

Salmon smolt on the other hand would perhaps be more vulnerable, in that they would remain in nearshore waters for longer periods while they feed and grow in preparation for movements farther offshore. However, like adult salmon juveniles appear to possess the ability to detect toxic concentrations of petroleum hydrocarbons (Maynard et al., 1981). If this is the case, then oilspills in the nearshore could possibly be avoided by this life stage. Additionally, as stated above, toxic concentrations in the range of concern (5-15 parts per million [Maynard et al., 1981] of aromatic hydrocarbons) would not be expected in marine waters. Measurements of oil 1 to 2 meters beneath a slick in the Tsesis spill ranged from 50 to 60 parts per billion (Kineman et al., 1980), which is far below the toxic range for juvenile salmon.

The eggs and larvae of pink salmon that occur in marine intertidal areas would be the most vulnerable of these earlier life stages. It would be difficult to quantify the impacts to a local pink salmon fishery from oilspill contamination in a spawning or larval rearing area. However, it is possible that a large portion of eggs and larvae could be lost. The gravity of this loss, however, becomes obscure when one considers that natural mortality of eggs and larvae may be as high as 75 percent for each of these life stages. The difficulty would be in ascertaining what percentage of those lost from oil pollution would have succumbed naturally. It is possible that most of a year class from a local population could be lost. When considering the large annual fluctuations in this species, however, this may not be significant.

In summary, it appears unlikely that oilspills would contact any area around the Yukon Delta or inner Norton Sound that are important to salmon. If this did occur, however, some adverse impacts could occur (i.e., avoidance, loss of prey, and mortality of eggs and larvae of pink salmon). Significant impacts (i.e., delay or blockage of spawning runs, or losses of large numbers of adult or juvenile salmon) are also unlikely. One year class of a local population of pink salmon could be severely reduced from oil contamination; however, when considering the large natural mortality and large annual population fluctuations for the Norton Sound region, the significance of this loss becomes questionable.

Other salmonids (artic char, Dolly Varden, and whitefish) could be impacted similarly to adult salmon. Since these species are generally not found in marine waters at lower life stages (eggs or larvae), impacts would be relatively minor.

Demersal Fish: Saffron and arctic cod, starry flounder, shorthorn sculpin, yellowfin sole, and Alaska plaice are the principal bottom-dwelling finfishes of Norton Basin. Generally found far offshore, some of these species move to shallow, inshore areas for spawning. The timing and distribution for this activity is not completely understood for all fishes in this group. Only small segments of the populations would be likely to come into contact with an oilspill, and only eggs and larval forms would be directly affected by oil pollution.

Eggs and larvae of some species are free floating and remain at or near the surface for possibly 1 to 3 months. A large oilspill during that time could reduce these populations, but the effect may not be apparent because of the large areal coverage by these life stages. Additionally, the large natural mortality, especially during the egg and larval stages, would probably mask any decline in numbers attributable to oil pollution.

The possibility does exist that oil could be transported to the sea bottom and affect adult or juvenile demersal fishes either directly or indirectly. Oil may be transported to bottom sediments through a variety of mechanisms and remain for 1 or 2 years and possibly longer. Zooplankton have been observed grazing on oil droplets and excreting "heavier than water" fecal pellets which eventually become deposited on the bottom. Oil could also be adsorbed onto suspended sediement particles and become incorporated in the bottom sediments. This latter mechanism could be enhanced by increasing sea state conditions (storms) occurring at the time of the spill. Turbulence in the water column may suspend bottom sediments while concurrently mixing oil over greater depths.

Once into the bottom sediment, oil could affect fish directly through uptake or injections and subsequent accumulation in various tissues or organs, or indirectly by the loss or contamination of food organisms (refer to Malins, 1977). The extent of these effects would depend to a large degree on the amount of oil reaching the bottom, the chemical composition of the oil, the size of the areal coverage of the oil, and the number of fish and/or prey organisms in the contaminated area. Additionally, once oil is incorporated into the sediments, effects to biota would depend to some degree on the rate of release back into the water. One should keep in mind that oil-in-water dispersions are not stable systems, and that organisms in a contaminated area would be exposed to continuously fluctuating concentrations.

It is difficult to state with any certainty how demersal fish would be impacted in this situation, however, certain speculations could be made. Demersal fish could succumb if toxic concentration were encountered, however, it should be noted that such concentrations are not likely to occur. Injestion or uptake of oil could result in disease and subsequent death of fish if exposure were maintained over a long period. On the other hand, demersal fish may detect the presence of the oil in a contaminated area and avoid such areas. If food organisms were depleted, fish would be forced to seek elsewhere for food. Sublethal levels of hydrocarbons could be accumulated in food organisms and injested and further accumulated by demersal fish. While this may suggest a pathway for biomagnification of hydrocarbons, research has shown that most crustaceans and fish rid themselves rapidly of hydrocarbons upon entering uncontaminated water (Malins, 1977). For highly mobile species such as cod, this may mean a short trip up the water column. For bottom dwelling flat fish (flounder, sole, and plaice) a longer exposure time would be anticipated.

The bivalve mollusks (clams or cockles) would probably be affected more than any other prey organisms. These shellfish can accumulate certain hydrocarbons very rapidly, and tend to retain these compounds for longer periods even after being placed in a clean environment (Malins, 1977). Since food-web relationships are not well known for demersal fish of this region, it would be difficult to state which species would be most affected by contamination of bivalves. However, feeding studies of starry flounder in Norton Sound indicate a high dependence (greater than 70 percent of the diet) on bivalve mollusks (Feder and Jewett, 1978). Implication are that food sources for flatfish are likely to become affected in a contaminated area.

Even though the above effects are possible, a significant impact to the demersal fish population of Norton Sound are not likely. This conclusion is based on the low probability of oilspill occurrence and the low probablity of a large demersal area becoming contaminated if a spill should occur.

King Crab: King crab in Norton Basin are distributed over a wide area, with red king crab occupying more of the inner basin and blue king crab occupying the outer portions (Wolotira et al., 1977). The biology of the king crab in this region is not well known, but studies from other areas show that these shellfish migrate into shallow waters to spawn during the spring and summer. During this period larval crab are released. These larvae, which are planktonic initially, gradually sink in the water column as they undergo a series of molts. This process may take several weeks. It is during this time that king crab are most vulnerable to oilspills.

Given the wide areal coverage by these larval crabs, it seems unlikely that an oilspill would result in significant adverse impacts to the Norton Sound king crab stocks. Even if all of the crab larvae in a contaminated area were killed, this would represent only a very small percentage of the total released in Norton Sound. Natural mortality would probably mask any loss due to oil pollution.

The area with the highest concentration of king crab in Norton Sound is located offshore from Nome. The Oilspill Risk Analysis indicates that there is a 43-percent probability that an oilspill of 1,000 barrels or greater would contact this area within 10 days if the onshore transportation scenario is assumed. The offshore transportation scenario probability for a similar spill

is 26-percent. The probabilities for a spill greater than 10,000 barrels contacting this area under the same conditions are 20 and 12 percent respectively, for both scenarios. Therefore, it appears that a pipeline to the proposed Nome onshore facility and tankering from this facility would represent a larger threat to the king crab in this area than offshore loading. In either case, it would be unlikely for a significant impact to occur. If an extremely large spill (100,000 barrels or greater) occured in this area during the time of larval release, it is conceivable that this local population could be reduced significantly. This reduction would not be noticed until 8 or 9 years later, when these crab entered the commercial fishery. The probability of this event would be extremely low.

In summary, based on the low probability of a spill occurrence, it would be unlikely that a contact between an oilspill and the Norton Sound king crab population would occur. If an oilspill did contact a portion of these stocks, it would be unlikely for a significant impact to occur.

Commercial Fishing: Impacts on commercial fishing activities under the proposed development scenarios would result largely from competition between the oil and fishing industries for labor, ocean-space use, and infrastructure services (refer to Terry et al., 1980, for a more detailed analysis). Additionally, some loss of fishery resources could occur on a localized basis as previously discussed. These losses would not be expected to occur over the long-term and therefore do not represent a significant source of conflict between the two industries. Significant regional declines in fishery stocks are also unlikely to result from OCS activities. However, if they did occur, economic losses would certainly be incurred by the commercial users of the resource or species that is affected. In the Norton Sound region, the Pacific herring fishery would be more vulnerable to this type of OCS impact than any other. Salmon fisheries could be affected; however, these effects would be short-term and localized.

Impacts on labor are discussed in Section IV.B.3., Impacts on Economic Considerations. In this disucssion it is revealed that labor impacts would be centered almost exclusively in the Nome area. Since this is an area in which neither harvesting nor processing activities have been or are expected to be significant in terms of western Alaska commercial fishing industry activities, no significant conflicts for labor between the two industries are anticipated. This conclusion applies to the entire Norton Sound region as well as Nome.

Impacts resulting from ocean-space use on Norton Sound fishing grounds would result from loss of fishing grounds due to offshore pipeline corridors and emplacement of drilling platforms and increased vessel traffic in certain areas. Additionally, loss or damage to fishing gear as a result of OCS operations could occur. The areas of joint use are very limited for the salmon and herring fisheries, because both fisheries occur in nearshore areas where little OCS activity is expected. A small area where pipeline corridors are expected to minimally reduce the area available for fishing is near Cape Nome. It is possible that one or two set gill net sites would be preempted by the proposed pipeline corridor; and, if the pipeline is buried, the sites would only be affected during the year in which the pipeline is constructed. The total loss to the fishery is expected to be minor since annual real gross income per gill net boat is not expected to exceed $6,000 in the salmon fishery or $4,000 in the herring fishery by the year 2000 (Terry et al., 1980).

Ocean-space-use conflicts resulting from platforms would also be minor if they occur at all. If it is assumed that each platform would preempt an area with a 600-meter radius, the total area preempted by the nine platforms suggested under this proposal would be approximately 1,000 hectares, which is less than 0.1 percent of the entire lease area. Even this very minor impact would be contingent upon how well established the groundfish fishery becomes in this area.

Increased vessel traffic in areas of joint use would increase the potential for fishing-gear loss or damage and collisions. This may come about as a result of survey boats traversing king crab fishing areas and entangling crab pot lines with their seismic cables.

OCS supply vessels would also traverse these areas, providing additional potential for pot loss. The fact that this gear is unattended makes it more difficult to spot and to avoid; it also makes it difficult for a fisherman to determine the cause of the loss and to receive compensation through the Fisherman's Contingency Fund. While these losses are expected to occur, it is unlikely that significant losses in catch would result. As OCS vessel operators become more familiar with the area, these types of gear loss should decrease. Since the volume of vessel traffic in Norton Sound fishing areas is not expected to increase significantly compared to the volume of the system, the probability for collisions would not be expected to measurably increase.

Gear losses as a result of oil fouling would also be unlikely. Given that the nearshore salmon and herring net fisheries are in areas of low oilspill risk (refer to discussion of fishery resources above), and that these gear types (drift and set gill nets, purse seines, and beach seines) are usually attended, the possiblity of gear damage is remote.

Competition between OCS and commercial fishing for infrastructure services is not anticipated. In fact, infrastructure development as a result of OCS development may benefit the commercial fishing industry. The development of port and harbor facilities in Nome is expected to include significant improvements to the Nome port facilities and small-boat harbor. The port projects, which are expected to be principally financed by the OCS industry, will eliminate the need to lighter freight into or out of Nome. They will significantly decrease transportation costs and, therefore, increase the feasibility of commercial fishing activities in Nome. The improvements to the small boat harbor are expected to be financed in part by property-tax revenues generated by OCS activities. The improved small boat harbor and port facilities will provide sufficient moorage space and water depth to allow larger boats to land fish in or operate out of Nome. This will significantly increase the ability of Nome to participate in the commercial fisheries of Norton Sound and the Bering Sea. Because there are other factors which will affect Nome's participation in these fisheries, it is not clear how the improved facilities will change the level of commercial fishing industry activity in Nome. However, the absence of such facilities will severely limit such activities.

In other instances, commercial fishermen may benefit from OCS operations in the area. For example, oil industry equipment may be dispatched to assist distressed fishing vessels, or weather information services in the area may be enhanced.

In summary, conflicts between the commercial fishing industry and the oil industry in the Norton Sound region would not be significant. Minor losses of fishing grounds and gear would occur; however, no loss of catch from these impacts would be expected. The fishing industry would benefit from development of the port and harbor facilities in Nome.

Conclusion: Impacts to the fish resources of Norton Sound would result largely from accidental oilspills contacting nearshore areas that are used by herring for spawning; by salmonids for spawning, rearing, and migration routes; and by king crab larvae for rearing. Additionally, oil transported to the bottom anywhere in Norton Sound could impact demersal fish. Should oil contact herring spawning areas or nearshore areas used by salmonids (especially pink salmon) for spawning or rearing, or by king crab larvae for rearing, significant short-term (1-year) losses to local populations could occur. These events, however, are considered unlikely. Oil contamination near the mouth of a salmon spawning river could invoke avoidance responses by migrating adult or smolt salmon; however, this is not expected to result in a significant impact. Oil contamination of bottom sediments would result in a loss of habitat and fish prey organisms and a subsequent reduction in biomass of demersal fish populations in the affected areas. While this loss of habitat may persist for 2 or more years, significant biomass reductions are not expected. Regional impacts (short- or long-term) to the fish resources of Norton Sound are not anticipated.

Impacts on commercial fishing activities would result from competition between the oil and fishing industries for labor, ocean-space use, and infrastructure services. Additionally, the short-term, localized reduction in fish resources previously noted could also impact commercial fishing activities. Local conflicts between the two industries would not be significant over most of the Norton Sound region except for the Nome area. The installation of a pipeline to the Nome terminal could preempt one or two gill net sites, and if the pipeline is buried this would only last for 1 year. Over the long-term, the construction of port and harbor facilities at Nome could benefit commercial fishing activities for the entire region. Other regional impacts (loss of fishing grounds, gear, and catch) would not be significant.

Effect of Additional Mitigating Measures: While the suggested measure requiring an "Orientation Program" does not prohibit activities which may have fishery-related impacts, it would provide a mechanism for informing OCS workers and subcontractors of the particular fishery-related sensitivities of this area. This increased awareness may preclude any action that would adversely affect the fishery resource or commercial or subsistence fishing. For example, operators of OCS vessels could be made aware of fishing areas and methods so that fishery-gear losses could be avoided.

The restriction on drilling activities proposed under the measure designed to provide "Seasonal Protection of Marine Mammals from Effects of Oilspills During Peak Migration Periods" would slightly decrease the potential for oilspills to contact the nearshore area around the Yukon River Delta during the period when adult salmon are migrating into the river and salmon smolt are out-migrating from the river system. Spills originating at points located within the 93 blocks in the southwest portion of the proposed lease do have small conditional probabilities (3 percent or less) of reaching the Delta within

10 and 30 days. This slight decrease would not change the conclusion that significant adverse impacts to the salmon resources of the Yukon River are unlikely.

The measure designed to protect the "Area of Special Concern" would prohibit the storage and loading of oil in 17 blocks nearest the Yukon River Delta. This measure would have the same effect as stated above for the seasonal restriction.

Cumulative Effects: Effects to the fishery resources or commercial fishing industry that would be considered cumulative with those of the proposal would result from the proposed marine terminal of the Lost River Mining Project, the proposed Port of Nome Deepwater Terminal, Oil and Gas Leasing of Calista Corporation Lands of the Yukon Delta, State of Alaska Oil and Gas Proposed Lease Sale 38, and federal OCS leasing in the Bering and Chukchi Seas. Because development scenarios for the preceding are relatively unknown, cumulative impacts will be discussed in a generic sense.

The proposed marine terminal for the Lost River Mining Project, the proposed Port of Nome Deepwater Terminal, and federal and state OCS proposed leases would act cumulatively in stimulating increased vessel traffic in the Norton Sound region. This would in turn increase the potential for ocean-space-use conflicts (i.e., loss of fishing grounds, fishing gear loss and damage, and collisions) over that which would occur only with the proposal. All of these proposals would probably have no significant effects except possibly those conflicts which arise from the State of Alaska lease sale 38. This sale could encompass areas in territorial waters (3 miles from shore) all around inner Norton Sound and the Yukon Delta which are jointly used by the commercial and subsistence herring and salmon fisheries. Therefore, it is possible that substantial increases in ocean-space-use conflicts between the petroleum and fishing industries could occur.

The development of the terminals at Nome and at the Lost River Mining Project could further enhance the fishing industry by providing increased docking space and improving the infrastructure services available to the fishing industry. Construction of these terminals may also adversely affect fishery resources. Chronic pollution which could occur in the vicinity of the proposed deepwater terminal at Nome could adversely affect salmon migration in and out of the Snake River. Additionally, dredge and fill operations conducted in these areas would remove habitat suitable for king crab. This would be a minor impact to the regional crab population; however, it may represent a significant loss to local subsistence fishermen.

Perhaps the most significant cumulative effects to fishery resources would result from the state of Alaska Oil and Gas Proposed Lease Sale 38. The probabilities for the impact of oilspills in the nearshore environment, particularly at the mouths of major salmon producing streams and herring spawning areas, would increase substantially from those stated above for the proposal. The probability for this kind of contact (between fish and oil pollution) then becomes likely. The probability of a significant impact would depend on the number and location of platforms and pipelines and the method employed for transporting the oil.

The oil and gas leasing on Calista Corporation Lands also significantly increases the probability of oilspill impacts on the fishery resources and commercial fisheries of the Yukon River. This also would depend on the location and intensity of development activites. An oilspill in a major channel of the Yukon River would probably have a greater effect on the salmon population than a spill of marine origin. However, employment of environmentally sound drilling practices would render this an unlikely occurrence.

Unavoidable Adverse Impacts: Unavoidable adverse impacts to the fishery resources of the Norton Sound region would result from accidental oilspills. As previously stated, impacts resulting from oilspills are unlikely.

Unavoidable adverse impacts to the commercial industry would include loss of fishing grounds from platform or pipeline installations and fouling of fishing gear from accidental oilspills. These impacts would be insignificant from a regional standpoint.

c. Impacts on Birds:

Introduction: Over 5 million nesting seabirds occur in the northern Bering Sea adjacent to the proposed sale area; and approximately 24 million waterfowl and shorebirds occupy the coastal wetlands surrounding Norton Sound, centering on the Yukon River Delta. Norton Sound proper has about 75,000 seabirds. This represents a relatively small portion of the major seabird population, which is primarily located west of Norton Sound.

Avian fauna, particularly diving seabirds and marine waterfowl, are perhaps the most sensitive of all marine organisms to oil pollution and the slowest to recover from a major population loss. Some species may take from 20 to 50 years to reestablish former population levels after major impacts occur (Wiens et al., 1979).

The major adverse impacts from OCS activities in the proposed sale area would come from oil pollution of the marine environment and manmade disturbance of bird populations and habitats.

The effects of oil pollution on birds is well documented. (For a more detailed discussion of generic impacts, refer to Alaska OCS Technical Paper No. 3 [1981] and the Final EIS for OCS Oil and Gas Lease Sale 60.) Direct oil contact is usually fatal or, in addition to indirect effects, causes substantial mortality. Oiling of birds causes death by hypothermia, shock, or drowning. Oil ingestion through preening of oiled feathers significantly reduces reproduction in some birds and causes various pathological conditions. Oil contamination of eggs by oil-fouled feathers of parent birds also significantly reduces egg hatching.

Indirect effects of oil pollution include reduction, contamination, and displacement of food sources, as well as contamination of habitat. A sudden oilspill-related, local adverse effect on major food sources that occurs during a migration stopover period, or during the nesting period, could lower reproduction and survival of bird populations that depend on that food source. Long-term, low-level contamination of food sources and habitats can also lead to chronic toxicity in birds through the accumulation of hydrocarbon residues that may adversely affect their physiology, reproduction, and behavior.

The other major potential cause of adverse effects from OCS activities on birds is manmade disturbance, particularly noise. One of the interrelated, potentially serious disturbance problems specifically identifiable with OCS activities is increased air and boat traffic near important nesting areas. The effects of aircraft, especially helicopter noise and presence over nesting colonial birds and nesting waterfowl, have been documented. Low-flying aircraft passing near bird colonies frighten most or all adult birds off their nests, leaving the eggs and young vulnerable to exposure, predation, and accidental displacement from the nest during hurried departures by the adult birds (Jones and Petersen, 1979; Hunt, 1976). Preliminary evidence has indicated that repeated disturbance could significantly reduce hatching success, fledgling success, and perhaps cause adult abandonment of eggs and young (Gollop et al., 1972; Scott, 1976). Other potential disturbance problems associated with OCS development include possible displacement of birds from important feeding and staging areas due to increased air and boat traffic and disturbance due to locating onshore facilities near coastal nesting areas.

Impacts on Seabirds: Seabirds are most vulnerable to oil pollution while foraging on or in the water, as well as rafting or swimming on the water surface. They are most sensitive to human disturbances at the colony sites during nesting. Vulnerability to oilspills is most acute during the spring when seabirds concentrate in open leads in the ice near the colony sites. If an oilspill reaches these ice leads, major impacts to seabird populations (greater than 50 percent mortality) are very likely to occur.

May through October, seabirds are directly vulnerable to oilspills throughout their foraging habitat, but particularly in the major offshore concentration areas (with 4 to 5 million seabirds) west of Norton Sound and in the Bering Strait. Within Norton Sound, offshore areas 10 to 12 miles south and west of Sledge Island and south of the large Bluff colony between Cape Nome and Cape Darby are vulnerable habitat areas for about 50,000 to 60,000 seabirds. Vulnerable foraging areas for about 16,000 seabirds occur in the eastern Norton Sound.

If oilspills occur during the winter, oil may become entrapped in the ice and released in leads during the spring. This is a possible threat to millions of seabirds returning to the region in the spring. Reduction in winter spawning success and fish larvae survival due to possible oil pollution under the ice, and in the water column, could reduce important food sources for seabirds returning in the spring and, therefore, reduce reproductive success and survival of local seabird populations in Norton Sound.

The oilspill trajectory analysis data for conditional probabilities, assuming that a spill occurs using the 10-day trajectory period, indicates the following. The Sledge Island foraging area (5,000 nesting birds) is at a high conditional risk (25-45 percent probability of spill contact) for the winter-spring season (December-May, Table 2, Appendix J). Most of the oilspill risk comes from the proposed pipeline routes to shore at Cape Nome and the proposed tanker facility. The overall unrisked probabilities for this habitat area are moderate to high (16-36 percent) for being contacted by oilspills (Appendix J, Table 7). The seabird foraging habitat offshore of Safety Lagoon, east to Rocky Point, is at high conditional risk (23-25 percent) for spill contact from the proposed tanker facility at Cape Nome and the pipeline from the eastern offshore blocks (Appendix J, Table 2, spill locations 7 and 8).

Considering unrisked final estimates, this habitat would have a moderate to high chance (11-26 percent) of being contacted by an oilspill (Appendix J, Table 7). The hypothetical offshore loading transportation scenario could substantially reduce the oilspill risks to the above foraging areas (Appendix J, Table 8, for two winter and three summer periods). The western water boundary of the oilspill trajectory model which parallels the offshore foraging habitat for millions of birds in the Chirikov Basin area has a high risk (27- to 30 percent) of spill contact from the proposed tanker route going southwest of the proposed sale area and a moderate risk (12- to 20-percent) from spills originating from the lease area or from pipelines to shore (Appendix J, Table 5). The overall unrisked probabilities indicate large flocks (density of 200 birds/km^2) that occur in this area may have a 12- to 13-percent chance of being contacted by oilspills. However, because of the distances between most potential spill sources and the major offshore bird concentrations and the variability in offshore bird densities on the water, it is unlikely that major bird flocks west of Norton Sound would come in contact with a spill originating from the proposed sale area. However, oil tankers coming from the sale area could still pose a major threat to seabirds in the Chirikov Basin.

Waterfowl, particularly sea ducks and marine oriented geese, are most vulnerable to oil pollution while foraging on or in the water, as well as rafting or swimming on the water surface. They are most sensitive to human disturbance while nesting. Direct vulnerability to oil pollution is most acute during the spring migration when sea ducks stopover in nearshore, ice-free areas during migration. If an oilspill reaches these areas, major impacts (50 percent or greater mortality) could occur.

During the nesting and summer season, May through September, waterfowl and shorebirds could be seriously threatened by oilspills that reach intertidal habitats along the Yukon Delta, along the southern coast of the Seward Peninsula, and the inner Norton Sound. On these coastal wetlands, hydrocarbons could be incorporated into the sediments and pollution would likely persist for several years. Productive feeding habitat and important food sources could be reduced and important nesting habitat could be contaminated, reducing nesting success for some waterfowl and shorebird populations. Threats of impacts from oilspills that may occur in the winter would come from oil that may be entrapped in the ice and released near the Yukon Delta or other waterfowl and shorebird concentration areas during the spring.

The oilspill trajectory analysis data for conditional probabilities, assuming that a spill occurs and using the 10-day trajectory period, shows the following. Coastal waterfowl/shorebird habitats from Safety Lagoon, east to Rocky Point (Table 5, Appendix J, land segments 19 and 21), have a moderate chance (11- to 14-percent probability) of being contacted by an oilspill originating from a pipeline from offshore blocks in the eastern land segments portion of the proposed sale area, going to a tanker facility near Cape Nome (Appendix J, Tables 5, 7, and 8). The overall unrisked probabilities are 5 to 10 percent for a spill contacting this area. Coastal habitats within inner Norton Sound and Norton Bay (land segments 10 through 17, Fig. IV.A.4.c.-2) have very little or no chance of being contacted by an oilspill within 10 days (Appendix J, Table 5). Oilspill threats to the Yukon Delta intertidal feeding and nesting habitat for millions of waterfowl and shorebirds is represented by land segments 1-6 (Fig. IV.A.4.c.-2; Appendix J, Table 5) and the offshore tidal

entrainment zone (Yukon Delta Summary, Tables 7 and 8). The intertidal habitat from Clarence Rhode Wildlife Range to Kotlik (land segment 5, Fig.

IV.A.4.c.-2) has a 7-percent conditional probability of oilspill contact from a particular spill point (land segment 4, Appendix J, Table 5) in the southeastern portion of the proposed sale area. Other coastal portions of the Delta have a 5-percent chance, or less, of being contacted by an oilspill originating from a hypothetical spill point in the proposed sale area.

The Yukon Delta entrainment zone (Appendix J, Fig. J-4) has a moderate to high conditional probability (17- to 22-percent) of being contacted by an oilspill within 10 days. If an oilspill reaches the entrainment (tidal influence) area, the chances of oil reaching the Delta are certain. The overall unrisked probabilities of one or more spills contacting this target are low to moderate (5- to 11-percent), depending on the size and location of the spill. If a large oilspill does contact the intertidal habitat, it is very likely to have serious, long term effects on waterfowl and shorebirds (see Section IV.B.2.a.).

The northeastern cape of St. Lawrence Island has a moderate to high (15- to 30-percent) conditional probability of being contacted by an oilspill (Appendix J, Table 5; land segment 30, Fig. IV.A.4.c.-2). Most of this risk comes from the hypothetical tanker route going southwest from the proposed sale area (Fig. IV.A.4.c.-1). Oilspills that reach this part of St. Lawrence Island would have the most serious effect if they contacted open-water areas during the spring when waterfowl (sea ducks) are using the area. Spills that contact this area during the summer may contaminate the lagoons and negatively affect some waterfowl and their habitat. However, this portion of the St. Lawrence coastal lagoon habitat represents only a small portion of the waterfowl habitat on St. Lawrence Island.

Summary: Most of the 5-million seabirds that occur in the northern Bering Sea nest and forage far west of the proposed sale area in the Chirikov Basin are unlikely to be affected by oilspills that occur in the proposed sale area or at the proposed tanker facility at Cape Nome. However, if tanker spills occur along the proposed tanker route (Fig. IV.A.4.c.-1) or spills reach ice leads west of Sledge Island, south of St. Lawrence Island, south of the proposed sale area along the ice front, some of these seabirds could be affected. (Flocks of 10,000 occur along the ice front and bird densities greater than 1500/km^2 occur in open water ice leads west of Sledge Island in the spring.)

Within Norton Sound, seabirds which nest at the Bluff and Cape Darby area and forage in the waters south of Safety Lagoon and Golovin Bay are at moderate to high conditional risk from oilspills occurring from the proposed tanker facility at Cape Nome and pipelines to shore. If a spill occurs in this area, severe local impacts (50-percent mortality) to seabird species (especially murres and cormorants), in addition to possible food-source reduction or displacement for other species as well, could occur. These birds are the most likely populations to be disturbed from air and boat traffic during exploration and development.

For the approximate 24-million waterfowl and shorebirds that occur in the Norton Basin area, the greatest risk from oil and gas activities in the proposed sale area would come from oilspills that may reach the intertidal habitats of the Yukon Delta. Spills that contaminate the intertidal zone would be

next to impossible to cleanup efficiently, and the oil pollution would persist for a very long period of time, reducing or contaminating very important waterfowl and shore bird feeding habitat. If a spill reaches the Delta during a storm tide, critical nesting habitat would also be contaminated, directly contributing to reduced waterfowl productivity. The oilspill trajectory analysis indicated the Yukon Delta has a relatively low conditional probability of oilspill contact from the proposed sale area (7 percent for land segment 5, Appendix J, Fig. J-4, Table 5, and an overall final probability of 1 percent or less). The Yukon tidal entrainment zone (Appendix J, Fig. J-4) has a moderate to high risk (17-22 percent, Appendix J, Table 2) of oilspill contacts. However, the expected hydrocarbons are indicated to be gas for this portion of the lease area, thus the risk of oilspills reaching the Delta may be considerably less.

Waterfowl and shorebird coastal habitats from Safety Lagoon to Golovin Bay have an 11- to 14-percent probability of oilspill contact (Appendix J, Table 2). Most of the risk to this habitat area would come from the hypothetical tanker facility at Cape Nome and the pipelines to shore. The other waterfowl habitat at high risk would be the northeast cape region of St. Lawrence Island which has a moderate to high (15- to 30-percent) conditional probability of oilspill contact, due primarily to the proposed tanker route going southwest of the sale area. Spills that reach this area could have severe local impacts on waterfowl populations in this area.

Conclusion: Marine and coastal birds and their habitats along the Seward Peninsula are very likely to interact with oilspills and disturbance during the life of the proposal. If a major oilspill occurs, substantial (25- to 50-percent) local bird mortalities are likely to occur (these local impacts may last from 1 to several years depending on the species and population affected). If a major spill inundates a large portion of the Yukon Delta intertidal habitat, significant regional impacts to waterfowl and shorebirds would occur. However, the oilspill risk analysis data indicates this event to be very unlikely, as are oilspill events contacting seabird concentrations west of the sale area. Therefore a significant long-term regional bird species population decline as a result of the proposed action is considered unlikely.

Effect of Additional Mitigating Measures: Among the suggested mitigating measures, the orientation program, along with the guidelines established in the Information to Lessees on Bird and Mammal Protection (see Sec. II.B.1.c.), should help to minimize human disturbance of nesting birds. However, compliance with air and boat traffic restrictions near bird colonies and other concentration areas is strictly voluntary. Air and boat noise, as well as other human activities outside of OCS activities, may have a negative effect on birds in the Norton Sound area. Public awareness and compliance with U.S. Fish and Wildlife Service regulations, and the recommended guidelines in the suggested information to lessees, could effectively eliminate most disturbance impacts.

This suggested mitigating measure concerning hydrocarbon storage and transportation measures, specific to the southern blocks (see Sec. II.B.1.c.), could reduce oilspill risks to the Yukon Delta.

Cumulative Effects: In addition to the proposed sale, other planned oil and gas development in the Norton Sound area and possible future hydrocarbon transportation through the Bering Strait could significantly reduce bird populations in the northern Bering Sea region.

The State of Alaska proposed sale 38, Norton Basin area of call, includes all coastal waters within 3 miles of shore along Norton Sound (Fig. I.B.-1). Because the state lease sale area of call is located immediately adjacent to the waterfowl and shorebird coastal wetlands and intertidal habitats, and especially along the Yukon Delta, risks of oilspills contaminating the Delta could significantly increase if this area is leased for oil and gas development. If state leasing and development occurs adjacent to the seabird colonies at Bluff, Cape Denbigh, and other areas, the risk of oilspills and human disturbance affecting these bird populations would increase.

The Calista Corporation's proposed oil and gas leasing on the Yukon Delta could also increase the risk of hydrocarbon pollution within the waters and marshland of the Delta. This planned activity would physically alter some waterfowl habitat and increase human disturbance of nesting species.

The cumulative effects of future OCS sales in the Bering and Chukchi Seas are impossible to predict at this time. However, if oil is found in one or more of the other proposed sale areas on the leasing schedule (such as Navarin Basin sale 83, Hope Basin sale 86, or Chukchi Sea sale 85), possible tanker traffic through the Bering Strait and Chirikov Basin would greatly increase the risks of oilspills occurring within the foraging habitat of the major seabird populations in the northern Bering Sea that nest on the Diomede, King, and St. Lawrence islands and Fairway Rock. If a large tanker spill occurred in the Bering Strait, it is likely to have severe impacts on these populations.

Other planned projects, such as port development in Nome, and possible future projects such as hard mineral mining in the Norton Sound area, could increase human disturbance of birds in this area.

The cumulative effects of the above projects, especially other hydrocarbon development activities, in addition to the proposal, may have significant, long-term regional effects on bird populations. The combined effects of the above projects would be significantly greater than that of the proposal alone.

Unavoidable Adverse Effects: In this discussion, most oilspills are considered unavoidable, while human disturbance of nesting seabirds and most nesting waterfowl and shorebirds is considered avoidable through voluntary compliance with the proposed recommendations on air and boat traffic in the suggested information to lessees (see Sec. II.B.1.c.).

The oilspill trajectory analysis indicates that the coastal habitat from Safety Lagoon to Golovin Bay is at risk from oilspills that would be related to the onshore development scenario at Cape Nome. Offshore loading could reduce this risk. However, oilspill-containment equipment could provide for protection of these lagoons by possibly diverting an oilspill away from the estuaries (stream mouths), especially during high tide.

Although the chances of an oilspill reaching the Yukon Delta from the proposed sale area are remote, a spill that comes within the area of tidal influence, or

a spill that occurs during a storm surge, would be impossible to direct away from the Delta. Spills or portions of spills that reach the Delta are likely to have significant long-term impacts. However, it is unlikely that spills originating from the lease blocks would contaminate a major portion of the Yukon Delta intertidal habitat due to dispersion and weathering of oil.

Large spills and chronic spills that occur within the unconsolidated pack ice of Norton Sound, especially in the western part of the proposed sale area, would be very difficult to contain and clean up with present oilspill cleanup technology. Such oil pollution would unavoidably affect some seabird flocks that happen to be in the area of the spill. These unavoidable spills could result in moderate to high impacts on local populations, but are unlikely to affect a major part of the regional seabird population.

Assuming oil development occurs throughout the proposed sale area, oilspills and chronic discharges could have unavoidable moderate to high local impacts on birds, depending on the extent and nature of hydrocarbon development, oilspill occurrence, and efficiency of oilspill cleanup.

d. Impacts on Marine Mammals (spotted seal, ringed seal, bearded seal, ribbon seal, walrus, beluga whale, minke whale, killer whale, and polar bear).

Overview of Potential Types of Effects. Many of the potential effects discussed in this section are primarily related to seals, walrus, and polar bear. The reader is directed to the overview in Section IV.B.2.e. for discussions of additional factors which may affect non-endangered whales, as well as endangered species.

Oil pollution and disturbance due to increased human activity could affect marine mammal populations found in the proposed sale 57 area. It is difficult, if not impossible, to accurately predict on a long term basis how interaction of such factors may affect each mammalian species found in or near the proposed sale area. However, available information can at least broadly define possible effects and help to identify those species most sensitive to various perturbations, particularly those effects observable on a short term basis.

Short-Term Direct Oilspill Effects: Direct (and indirect) effects of spilled oil would vary, depending on the population density and physiological status of the affected mammal species, season and meteorological conditions, chemical or physical characteristics of the spill, duration of exposure, type of exposure (e.g., ingestion versus external contact), and other factors. An effect which is often thought to be associated with spilled petroleum products is direct mortality to marine mammals due to toxicity associated with contact, such as may occur when individual organisms are coated by spilled oil. Studies suggest that for certain species, direct mortality as a result of contact with spilled oil may not be an immediate result. Geraci and St. Aubin (1980:1) concluded "Surface contact is threatening to those species which rely on hair or fur for thermal insulation, such as sea otters, fur seals, and polar bears." LeBoeuf (1971), who evaluated effects of the 1969 Santa Barbara spill, concluded:

> "The crude oil which coated many weaned elephant seals at San Miguel Island in March and April had no significant immediate nor long term (1 to 15 months later) deleterious effect on their health. Had the

rookery been contaminated earlier in the season when females were nursing, pups might have ingested the crude oil and more serious consequences might have ensued."

Brownell and LeBoeuf (1971) concluded that crude oil contamination of California sea lion rookeries on San Miguel Island due to the same spill did not have a significant effect on pup mortality. Davis and Anderson (1976) reported no significant difference in the direct mortality of oiled and unoiled grey seal pups found in surveys of polluted beaches in England. However, species such as sea otters or fur seals may be particularly sensitive to oil contact. These species rely on their fur for insulation as opposed to other species which minimize heat loss with a layer of blubber. Exposure of sea otters to crude oil in natural environments "Would probably cause significant thermal stress and could lead to hypothermia and/or pneumonia resulting in death," (Kooyman and Costa, 1978). Although Norton Sound is not a habitat of sea otters, similar thermal effects could occur for seal pups still in the juvenile pelage if oil contact occurred, possibly via the mother (Costa, 1980). Immature ringed and/or bearded seals may be susceptible to such effects in the proposed sale area. According to Burns and Frost (1979:69), seals hauling out on the ice through surface water could contact oil, which could subsequently disadvantage newborn (or recently weaned) pups with an insufficient blubber layer, or those which may ingest oil through nursing. In addition, preliminary reports of experiments on captive polar bears by Canadian researchers suggest that this species may be highly sensitive to effects of oil if ingested following direct contact (Anonymous, 1980; Costa, 1980).

However, response to acute contact with oil by certain marine mammals may be manifested by a variety of apparently non-lethal physiological effects. Geraci and Smith (1976) found that yearling and older ringed seals immersed in crude oil for 24 hours suffered transient eye problems, minor kidney, and possibly, liver lesions, but could detect no permanent damage. The same workers found that harp seals fed 75 milliliters of crude oil suffered no significant effects. Geraci and St. Aubin (1979), in review of the latter research, considered the dosage used as "substantial," but that the pathological changes could have been induced by administration at higher but "unrealistic" levels. Geraci and Smith (1977) concluded that seals are not known to be carrion feeders, and any oil that they might consume from live prey would be negligible. Also, Geraci and St. Aubin (1979) concluded that their experiment exposed ringed seals to gaseous, volatile hydrocarbons at concentrations higher than would be encountered as a result of an oceanic spill, yet no associated lung pathology could be detected. Engelhardt et al. (1977) showed that petroleum hydrocarbons are absorbed by ringed seals exposed by both immersion (absorption during immersion, probably via skin or respiratory surfaces) and ingestion. Apparently, the liver and renal functions of this species serve to excrete and/or detoxify hydrocarbons absorbed during short term exposure. It is likely other seal and marine mammals have similar excretory and/or detoxifying mechanisms. However, the efficiency of detoxification and excretion under conditions of sustained long term exposure is unknown. Davis and Anderson (1976) detected a lower mean weight of oiled grey seal pups as compared to unoiled pups in their field analysis but could not attribute the difference to the effects of oil alone.

Behavioral effects are not well understood, but for the few species studied, increases in grooming behavior are likely (Geraci and St. Aubin, 1979 and 1980). As observed in ringed seals (Geraci and Smith, 1976) increased aggression and irritability may also result. Since field observations of sea lions suggest that scent is important in recognition of pups by females (personal communication with K. Schneider, Alaska Department of Fish and Game, 1980), it is possible that coating of marine mammals or other contact with oil could inhibit such recognition and lead to abandonment and starvation of young. Of the species present in Norton Sound, such an effect may be most likely for walrus. This species is noted for a relatively long nursing period and for herds containing large numbers of unweaned young. Geraci and St. Aubin (1980) stated that change in feeding, diving, mother-pup interaction, herd organization, and haulout behavior of oiled animals could affect their survival. Certainly a possible behavioral effect of mammals contacting polluted habitat is avoidance. According to Burns and Frost (1979:68):

> "It is not known whether bearded seals will avoid the small spills of fuel or crude oil which are inevitable. Observations of Eskimo hunters suggest that they, as well as ringed seals and walruses, will. A chronic fuel spill at Wainwright, Alaska, which produced a slick more than 3 miles long, was reported to have resulted in low numbers of seals and very poor hunting near that village, until the fuel leak was stopped. Hunters from Diomede Island, Alaska, pour gasoline in the water if they think a skin boat may be imperiled by milling walruses. We have no data on which to evaluate avoidance of limited spills by bearded seals."

Geraci and St. Aubin (1980) cited instances where some pinnipeds and sea otters have been known not to avoid oil. According to these workers (Geraci and St. Aubin, 1980), critical knowledge regarding avoidance of oil by marine mammals is clearly lacking. Thus, although likely for some species, it is not clear as to the extent to which abandonment of habitat due to short-term, small (or large) oilspill presence would occur.

In summary, direct contact with oil may affect marine mammals in the proposed sale area in a variety of physiological and behavioral manners. Ultimate response of local populations to direct exposure would vary, dependent on such factors as spill characteristics, species productivity, population status at the time of a spill or spills, other sources of mortality, and unrelated change in species distribution or habitat quality. The probability of wide-spread direct effects on seal populations is directly associated with the probability of large spills affecting major regions. These probabilities are low; and, since direct effects in many cases may be transient, they would be of significance primarily on a localized scale (see the following discussion on Site-Specific Impacts). Thus, for many of the species occurring in the Norton Sound area, such as bearded seal or walrus, of greater concern are long-term, chronic, direct or indirect effects associated with oil and gas development (Geraci and St. Aubin, 1979; Burns and Frost, 1979:69, 71; Burns, 1980; and Kelly, 1980:10).

Long-Term and Chronic Direct Effects: It is likely that longer exposure or repeated exposure of marine mammals to spilled oil could result in more significant physiological effects than those discussed above, particularly in

terms of irritation of eyes, liver tissue, or degradation of pelage. The ultimate direct effects of low-level, chronic oil contact on marine mammals are not readily predictable. In fact, it has been suggested that long-term effects can only be assessed under field conditions (Geraci and St. Aubin, 1979 and 1980), primarily through monitoring efforts. One possible result of low-level or chronic pollution would be to contribute to physiological stress on marine mammal populations which may be at or near carrying capacity. Some writers such as Geraci and Smith (1977) have suggested that oil contact may trigger death in stressed seals. Stress in wild mammal populations (characterized by decreased reproduction, decreased resistance to disease, and increased mortality) may be induced by a complex of factors related to population density, social interaction, nutritional factors, genetic changes, climate, and a host of other environmental influences. The relative importance of stress-related factors suspected of causing changes in small terrestrial mammal populations has been studied and debated for years (Christian et al., 1965; Christian, 1971; Batzli, 1970; Keller and Krebs, 1970; Selye, 1973; and Terman, 1965).

From this and similar research with other mammalian species, it can be concluded that responses of wildlife populations to individual stressors are extremely varied; and the extent to which chronic, direct oil contact would contribute to physiological stress, thereby affecting marine mammal populations, is also variable. Populations or individual wild animals which appear to be under stress associated with density, habitat deterioration, or reduced food availability may respond to interactions of these factors with chronic, low-level oil contact. At present, pinnipeds of the Bering Sea appear at or near maximum levels of population and show somewhat more pathological conditions than counterparts in the Gulf of Alaska (Fay et al., 1979:29). Walrus, in particular, have been identified as possibly at the threshold of their winter-range carrying capacity (Fay et al., 1977). Nevertheless, it would be premature to conclude that walrus (or other pinnipeds) in the northern Bering Sea are highly susceptible to stress-mediated population responses due to chronic effects of oil pollution. Relative significance of interaction of other factors such as legal or illegal harvests, reduced habitat carrying capacity due to over utilization, etc., is not well understood and may be as important, or more important, to population dynamics.

Indirect Effects of Oil Pollution: Indirect effects of oil pollution on marine mammals would be those associated with changes in availability or suitability of various food sources. Species which rely primarily on fish or pelagic invertebrates, including spotted seal, ringed seal, beluga whale, and ribbon seals, would possibly be affected on a localized basis in direct proportion to localized impacts on prey species. Lowry et al. (1978a and 1979b) reviewed mechanisms by which prey species such as herring, capelin, cod, shrimp, and amphipods may be affected by oil toxicity in immature or adult stages. In reference to prey species of Bering Sea marine mammals, they concluded:

> "Pollutant levels high enough to cause large scale die-offs of individuals will probably occur only on a very localized basis (except where oil or pollutants are trapped under the ice and transported long distances in a relatively unweathered state). The greatest concern may not be with these local catastrophic events but with long-term sublethal effects of pollutants. Individuals may not

> be killed directly, but very low concentrations of pollutants may affect locomotion, metabolism or reproduction and lead to substantial reduction of populations over several generations (Percy and Mullin, 1975). These long term reductions are of special concern in considering food availability to consumers." (Lowry et al., 1979b: 621.)

Mammalian species such as bearded seal or walrus may be more likely to show trophic-related effects in a specific locale since they rely on relatively sedentary benthic food sources. Kelly (1980) stated that development activities that adversely affect the benthos may result in greatest impacts on walrus. A fairly substantial literature exists which documents field and laboratory-observed effects of oil on bivalves and of tissue concentration of hydrocarbons in such organisms. These sources suggest that mortality of walrus prey would usually be limited to the immediate area of the spill; however, reduced productivity of benthic prey species as a result of sublethal effects over larger areas is possible, as would be tissue accumulation of hydrocarbons in invertebrates. In arctic and subarctic environments, oil in sediments would be degraded slowly, and intermittent redeposit of sediment by currents could compound and extend impacts (Clark and Finley, 1977) on bearded seal and walrus prey. Therefore, to the extent that spills would affect productivity of benthic prey organisms, localized change in distribution of bearded seals and/or walrus would be possible and evident in the short-term.

Another important and specialized trophic link is that of the winter dependency of polar bears on seals, especially ringed seals. Indirect or direct effects of pollution or disturbance (see below), causing change in ringed seal distribution, may indirectly affect polar bear distribution or reduce their exploitable food sources. Such impacts in the proposed sale area are likely to have relatively minor consequences as far as overall bear populations are concerned, since the more important habitat for the species are further north. Nevertheless, localized effects are possible; and, as for other indirect effects discussed above, cumulative long term impacts may be more significant (see below).

Thus, for marine mammals feeding on pelagic and highly motile organisms, short-term, indirect impacts on regional marine mammal populations as a result of the proposed sale may be relatively minor because alternative food sources are likely to be exploitable or major mammalian population segments may obtain the bulk of their nutrition elsewhere than the proposed sale area. Long-term cumulative impacts may be more significant.

As previously discussed in Short-Term Direct Oilspill Effects, it is likely that frequently contaminated habitats would lead to temporary avoidance and possible longer term abandonment of habitat by marine mammals in the proposed sale area. Hauling areas of walrus or spotted seal, if oiled, may be vulnerable to such impacts and are discussed more fully under Site-Specific Impacts herein.

Other indirect effects of oilspills on marine mammals include possible bioaccumulation of hydrocarbons and petroleum-derived compounds. According to Risebrough (1979), little is known about pathways of possible accumulation, and virtually nothing is known of their persistence in marine mammals. Geraci and

St. Aubin (1980) suggested that central nervous and reproductive functions of marine mammals such as walrus or bearded seal may be affected by long term ingestion of bioaccumulated pollutants. Neff (1979) in a review of literature on toxicity and ecological effects of marine disposal of drilling muds, concluded that heavy metals associated with used drilling muds are of relatively low acute toxicity; have a very limited bioavailability; and, therefore, have little potential for accumulation in marine mammals if disposed of at sea. Certain species of seals are suspected of having abilities to detoxify methyl mercury obtained through ingestion, and sea otters may have an inherent mechanism which protects them from the effects of cadmium (Risebrough, 1978). Natural and background levels of heavy metals, chlorinated hydrocarbons, and other toxic substances in the marine environment (or marine mammal tissues) make it extremely difficult to evaluate the effects of bioaccumulation of petroleum-related hydrocarbons on marine mammals.

Effects of Noise and Disturbance: It is well known that shock waves associated with explosives may be injurious to marine life. Shock waves associated with seismic air guns would not be immediately injurious to marine mammals (Geraci and St. Aubin, 1980), although non-lethal noise may affect behavior (see below). Geraci and St. Aubin (1979) reported that high frequency sounds cause permanent ear damage in laboratory animals and could adversely affect marine mammals. However, low frequency sounds, such as those likely to originate from drilling and platform operations, are much less physically destructive. Physical adverse effects from low frequency sounds on cetaceans are unknown; however, noise does have behavioral and physiological effects on birds and other mammals (Fletcher, 1971). The response of animals to acoustic stimuli have generally shown variance in behavioral and physiological effects dependent on species studied, characteristics of the stimuli (e.g., amplitude, frequency, pulsed or non-pulsed), transmission medium, season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, etc.

Airborne Noise: Disturbance related to oil and gas support activities during all phases of the proposed project, especially that associated with air traffic, could have adverse effects on marine mammals which occupy consistently used hauling areas near the proposed sale area. Pitcher and Calkins (1977 and 1979) stated that harbor seals are susceptible to disturbance from low-flying aircraft and noted for mass exodus of hauling areas in the event of such disturbance. Since spotted seal pups are relatively independent by the time hauling areas are established in Norton Sound and on St. Lawrence Island, it is unlikely that mass exodus of hauling areas would lead to substantial pup mortality. However, repeated aircraft-associated disturbance of hauling areas could lead to eventual abandonment of such habitats. Similarly, walrus hauling areas (Graphic No. 5A) may be locations where such effects could occur. According to Kelly (1980), walrus will leave haulout areas in response to the presence of man and continued harassment may prevent recolonization. Noise from aircraft have been observed to cause stampedes from shore and ice habitats. Burns and Harbo (1977) reported variable responses of marine mammals occupying ice habitats to survey aircraft. Bearded seals are described as reacting mildly to an airplane, remaining on the ice until the survey airplane (at approximately 300 ft altitude) was directly overhead. Burns (1980) commented that on warm, calm days bearded seals exhibit little concern for aircraft, yet in winter they are extremely sensitive to sound sources on the ice. Burns and Harbo (1977) reported that spotted seals reacted "strongly" to sounds of aircraft, even at considerable distance, by erratically racing across floes

and eventually diving off. Walrus response observed by the latter workers was variable, depending on weather, and apparently the walrus were most sensitive to aircraft disturbance on cold, overcast days. Salter (1979) found that escape reactions of walrus could be precipitated by helicopters at distances of 1.3 kilometers (0.8 mi); less dramatic behavioral responses were noted for noise sources at distances as much as 10 kilometers (6.2 mi). These observations are intended only to provide the reader with indications of the variable sensitivities of the species of concern, as well as factors affecting such sensitivity, rather than as definitive indices of sensitivity. As for the species described above, non-endangered cetaceans such as the beluga whale, may also respond adversely to repeated overflights of aircraft at low altitudes. Fraker and Richardson (1980:63) reported observations of beluga whale sensitivity to aircraft as well as to boats (see below). According to U.S. Fish and Wildlife Service (1979), denning polar bears have exhibited intolerance to disturbance which, if it occurred on a regional scale, could affect polar bear productivity and population levels.

Underwater Noise: As for airborne noise and disturbance, the potential for impact of underwater noise on marine mammals depends on two major factors: characteristics and transmission of the noise source and behavioral sensitivity of a species. In general, more is known about the former than the latter. Therefore, for certain types of underwater noise, there are means by which zones of potential influence can be robustly estimated (either through empirical measurements or theoretical predictions), but there presently is little data by which ultimate impact on various species may be predicted with accuracy. Biologists generally agree that the acoustical sense of aquatic animals constitute the most important distance receptor (Turl, 1980). Many marine mammals appear to be highly dependent on the underwater acoustic environment for at least intraspecific communications; location of food; spatial orientation; avoidance of predators; and, potentially, a host of other important life processes. Many examples of the significance of acoustic stimuli to marine mammals exist, e.g., it is well known that toothed whales (dolphins, beluga, and killer whales, etc.) have a highly developed echolocation capability reliant on high frequency pulsed sounds produced by the animal.

Noise sources which may be transmitted through water include not only those whose source is in the aquatic medium, but those adjacent to it as well. However, due to the reflective chracteristics of the atmospheric-aquatic interface, mechanical energy transmitted by air is likely to be reflected and not enter the water. Evidence exists which shows that noise from aircraft, however, can enter the water column in substantial amounts (Fraker et al., 1981). Noise propagated in the aquatic medium is transmitted rapidly and effectively. Many variables may affect the detection range of introduced noise. These include levels of ambient noise; spreading characteristics (spherical or cylindrical); channelization; absorption losses; scattering losses; and, of course, initial signal strength and frequency (Acoustical Society of America, 1981; Fraker and Richardson, 1980; Turl, 1980; Schmidt, 1980). Relative significance of such variables varies, dependent on the degree of temperature stratification of the water column, salinity, presence or absence of ice (and its bottom topography), sea state and wind velocity, water depth, etc. For example, water temperature and ice conditions may frequently lead to channelization of sounds into the near surface zone of the winter arctic marine environment. Sound velocity characteristics may be considerably different in such an area during summer when mixing of isothermic layers would

occur. However, very little is known about propagation paths or losses for acoustic energy in arctic environments (Acoustical Society of America, 1981:43). Holliday et al., 1980, concluded that their data on underwater noise measurement near Barrow verify that characteristics of underwater noise spectra (frequency characteristics) and amplitude disturbance (loudness) in the arctic is best predicted through continued empirical studies.

A variety of petroleum industry sources seem likely to contribute to underwater sound levels, including supply ship noise, icebreakers, aircraft noise, drilling noise, and seismic exploration. Other noise from fishing vessels, snow machines on the ice, outboard motors, powerplant pumps, etc., may also be introduced. Malme and Mlawski (1979) found that low frequency drilling noise associated with drilling rigs on Beaufort Sea islands (one artificial and one natural) was detectable up to 4 to 6 miles under low ambient levels and about 1 mile under high ambient levels. These observations were made under winter ice conditions and are not applicable to summer conditions or other drilling equipment. However, they estimate the low frequency (5-29 Hz) drilling sound levels would approximate ambient levels from 12 knot winds at 5 or less miles in open water. Holliday et al., 1980, concluded that their measured ambient levels in the Prudhoe Bay area generally agree with those of Malme and Mlawski (1979). Although recorded levels at certain frequences varied between reports, diesel engines tones were recorded (near Narwal Island) at a relatively high frequency. Turl (1980) reviewed measurements by Malme and Mlawski (1979), Ford (1977), and Kramer and Wing (1976) of underwater noise associated with offshore oil operations, including noise of an artificial island, a semi-submersible platform, crew boats, tug and barge traffic, and suction dredges. He concluded that such noise can cover a broad frequency range with, in some instances, signal-to-noise ratios above ambient levels that would be capable of reaching 30 to 50 nautical miles from the source before being weakened. Buerkle (1975) concluded that offshore drilling operation sounds may be detectable for 13 to 40 miles from the source. Ljungblad et al. (1980) recorded noise associated with geophysical exploration 60 nautical miles from its source (source levels at approximately 248 db re 1 uPa at 1 m). Mohl (1980) predicted that large arctic class tankers may insonify 30,000 square kilometers with decibel levels that would be almost three times as great as "quiet, under-ice" levels.

Turl (1980) reviewed literature on experimentally determined auditory capabilities of certain dolphins, porpoises, toothed whales (including the beluga), harbor seal, ringed seal, and the California sea lion. He concluded that lower hearing limits of such species are all less than 1.0 KHz, ranging from 16 Hz to 1.0 KHz. Upper limits for the cetaceans listed were from 30-150 KHz and for the recorded pinnipeds, 30-50 KHz. Therefore, it is likely that most marine mammals are capable of detecting many manmade underwater sounds, given adequate amplitude. Some preliminary evidence exists to suggest that belugas cannot hear drilling noise, whereas bowhead whales may be able to detect it (assuming characteristics of bowhead vocalizations are an index of their hearing sensitivity) (Acoustical Society of America, 1981: 21). Similarly, different seals may or may not be able to detect various industrial sounds. The frequency range of icebreakers and tugs is broad (American Acoustical Society, in press: 25) and probably detectable by many species. Responses to disturbance are, for the species observed, generally highly variable. Cetaceans may respond to and avoid noise sources which produce a sudden, variable pulse and/or high amplitude noise. Some hypotheses link cetacean strandings to underwater noise (Geraci and St. Aubin, 1980). Gregarious toothed whales

typically respond to sudden disturbance by sounding, dispersion, and regrouping (Geraci and St. Aubin, 1979, in reference to Leatherwood, 1977). Fraker (1977b) and Fraker and Richardson (1980) discussed observations of direct avoidance by belugas of tug and barge traffic. As suspected for certain porpoises, it is believed that belugas may avoid sonar-reflecting barriers such as suspended microbubbles in heavily used marine traffic corridors, as well (Fraker, 1977b; Fraker and Richardson, 1980). Terhune et al. (1979) reported decrease in underwater vocalization (due to change in behavior or emigration) of harp seals in pupping areas following vessel noise intrusion. Other workers have suggested that ice-breaking tanker traffic may create noise sufficient to interfere with marine mammal communications. Burns et al. (1980) presented correlational analyses that showed significant differences in breeding ringed seal densities as associated with the level of geophysical exploration activity on the shorefast ice of the Beaufort Sea. Repeated disturbance of walrus may reduce survivorship of young calves if nursing is inhibited or if females abandon calves. Coincidental evidence suggests that walrus distribution in the high Canadian arctic may have been affected by establishment of permanent logistical bases (Salter, 1979).

Although evidence exists to suggest certain adverse effects on non-endangered marine mammals may result from underwater manmade noise, there are many instances of animal behaviors or physiology not being affected detrimentally. For example, several marine mammal species are known to be attracted to boat noise. At best, species of potential sensitivity at important life stages may be identified, such as the potential problems associated with breeding ringed seals and disturbance due to geophysical exploration. However, there is little information available to predict the population-wide impacts of industrial disturbance for various species or to compare its relative significance to other factors. For example, change in ringed seal density associated with proximity to Eskimo villages also is known to occur (Burns and Eley, 1978). Certainly of major significance to marine mammals is how noise may interact with visible phenomena or previous experience (such as disturbance associated with hunting) in terms of ultimate behavioral or physiological response. As for chronic oilspills, speculation exists as to the potential contribution of physiological stress of marine mammals which may be associated with industrial noise. Such an impact could affect reproductive rates, resistance to diseases, or endocrine balance of individuals. However, it would be premature to conclude any marine mammal in the proposed sale area is particularly sensitive to stress-mediated response associated with noise. Such conclusions would not be feasible until the relative importance of other factors is understood.

Natural Gas and Gas Condensates: Currents, wave action, and wind would be expected to disperse, dilute, and evaporate gas and gas condensate pollutants rapidly. However, animals in the immediate vicinity of a gas leak may be affected at the occurrence, or shortly after a leak would occur. Inhalation of toxic vapors may be fatal to marine mammals (dependent on the degree of exposure), but such effects are relatively unlikely to occur to an extent significant enough to affect the overall status of endemic mammal populations.

Other Impacts: Hamilton et al., 1979, reviewed other impact-producing agents which may be associated with oil and gas exploration and development. Factors which may directly affect marine mammals include shoreline alteration, facility siting, dredging and filling, and secondary development. The extent of such impacts is most readily assessed in localized or short-term analysis and

projections. During exploratory phases of the proposed sale, most of these impacts on marine mammals are not expected to be significant, unless noted otherwise below. Of major concern would be permanent loss of habitat as the result of facility siting and secondary development. Existing legislative constraints and permitting procedures may serve to minimize these localized impacts. Long term and aggregate effects of such factors are treated under Cumulative Effects.

Site-Specific Impacts: Unless otherwise specified, oilspill contact probabilities referred to in this section assume the occurrence of development to the extent estimated herein (Sec II.A.) and associated spill rates (Lanfear and Samuels, 1981). Attention is devoted to spills greater than 1,000 barrels which may have a trajectory period of up to 10 days. Appendix J, Table 15, shows that land segments noted as spotted seal hauling areas (Cape Nome-Solomon, segment 21; Rodney Point, segment 19; Cape Darby, segment 18; Cape Denbigh, segment 13; Besboro Island and Stuart Island, segment 9; and near St. Michael, segment 8), have from 0- to 9-percent chance of spill contact. Therefore, it can be concluded that during the life of the proposed project, direct effects of oilspills (see above discussion) at important spotted seal coastal hauling areas are relatively unlikely. Although impossible to quantify precisely, it is unlikely that spotted seals would suffer major food chain related, indirect effects as a result of spills associated with this proposed sale. As discussed in Section III.C.4., this species feeds largely on pelagic, diverse, and highly motile food sources, suggesting that a substantial reduction of an overall food supply is very unlikely. However, localized food losses or localized avoidance of polluted areas may occur (see Sec. IV.B.2.b). Temporary shifts of animals away from polluted areas as an avoidance reaction or in search of prey could occur, but as indicated by the above oilspill risk estimates for known hauling areas, such shifts would be unlikely. Also of concern are risks to ringed seal breeding habitat, especially extensive shorefast ice areas of the eastern and southern Sound perimeter. Appendix J, Table 7, shows that the most extensive shorefast ice areas (ice zones 1-6) are generally of low (0- to 6-percent) risk. Risks to land segments along the northern coast (Appendix J, Table 15, segments 14-24), and mid-boundary targets (Table 7) provide an index of ringed seals' breeding-habitat vulnerability. In general, contact rates for those land segments are low (Appendix J, Table 15, 0- to 9-percent chance), although mid-boundary target No. 1 (a rectangular offshore zone extending from approximately Nome to Rocky Point) shows moderate probability (19 percent) that spills could possibly move toward, or occur in, the vicinity of shorefast ice along the northern coastline. As shown in Appendix J, Table 15, eastern St. Lawrence Island has a relatively high (21 percent) chance of contact with spilled oil, suggesting that ringed seal breeding habitat in that area may be more vulnerable than areas within Norton Sound. However, in general, it appears that major shorefast areas within Norton Sound are at low risk; and, therefore, it is unlikely that major direct effects on ringed seal breeding areas would occur. However, as indicated by higher probability of oilspills occurring in offshore areas and at eastern St. Lawrence Island, the possibility remains that localized direct effects (especially to seals occupying open water or drift ice) could occur. As for spotted seals, it is unlikely that major, indirect, food-chain-related impacts on ringed seal, bearded seal, ribbon seal, or walrus would occur as a result of the proposal, although localized disruption of food resources could occur.

Another species occupying coastal habitats near the proposed sale area in summer, and during migratory periods, is the walrus (see Sec. III.C.4). Less frequently used hauling areas such as Sledge Island, Besboro Island, or shorelines near Egavik would generally be under low (0- to 6-percent) risk (Appendix J, Table 15, segments 12, 13, and 23). However, major hauling areas on eastern St. Lawrence Island and the Punuk Islands may be under greater risk as indicated by the higher level estimated for segment 30 (Appendix J, Table 15, 21% chance). It was assumed (Sec. II.A.; Lanfear and Samuels, 1981) only gas, and not oil, would be present in the southern blocks. In the unlikely situation that oil would be found therein, risk to this area would be higher than the latter figure. Thus, it can be concluded that localized direct effects on walrus could occur in the latter vicinity, either in the form of avoidance of polluted areas or localized disruption of food supplies. Since the eastern St. Lawrence Island and Punuk Island hauling areas are occupied at certain times by 60,000 or more walrus (including females with immature young), impacts in this area would be of particular concern. To summarize the above, most spotted seal and walrus coastal hauling areas around Norton Sound, and shorefast ice breeding habitat of ringed seals, are at low level of risk to contact from spilled oil, as may be associated with the proposal (Alternative I). Areas of greater risk are eastern St. Lawrence Island and Punuk Island marine mammal habitats. Over the life of the proposed project, localized direct and indirect effects in more vulnerable coastal marine mammal habitats (such as eastern St. Lawrence Island) are possible, but generally unlikely, given the rates of oilspills assumed herein.

Not only of importance are coastal habitats and coastal concentrations of marine mammals, but also potential impacts on animals frequenting offshore areas. As discussed in Section III.C.4, thousands of walrus, bearded seal, ringed seal, ribbon seal, and beluga whale move through the northern Bering Sea in their annual migration. Although major portions of the spring walrus migrant herd travel west of St. Lawrence Islands (Kelly, 1980), large numbers can occur within the area which is depicted as the area of walrus abundance on Graphic No. 5C. It is estimated that as much as 33 to 50 percent of the walrus population (as much as 100,000 walrus) will move east of St. Lawrence Island and immediately adjacent to the proposed sale area in spring. In consideration of the variable ice conditions of this region, it is reasonable to conclude that during winter, and especially during migratory periods, areas west of 165° W. longitude are potential sites where major portions of walrus and ice-associated seal populations are very likely to occur (see Sec. III.C.4.). Burns et al. (1980), described two major ice remnants which occur to varying extent in the northern Bering Sea in late spring and which are known to serve as concentration sites for seal and walrus. One tends to occur directly west of the proposed sale area. Thus, it is particularly important to consider the extent to which spilled oil may move into these concentration areas and migratory corridors, or toward important offshore wintering areas.

Appendix J, Table 7, shows that there is a 26-percent chance that spills during winter would move to the southwest and intersect the area depicted in Figure J-3 as mid-boundary target No. 4. There would be an 11-percent chance that spills greater than 10,000 barrels could move similarly. Appendix J, Table 15, shows a 4- to 21-percent chance (segments 31-33) that spills would move to the southwest beyond the oilspill simulation area. Appendix J, Table 7, shows a higher probability (53 percent) that spills associated with the proposed sale in winter could move to the northwest and intersect the area depicted in Figure

J-3 as mid-boundary zone 5. Appendix J, Table 15, shows that there is a 13- to 23-percent chance that spills would move to the northwest beyond boundary segments of the oilspill simulation area (past segment 26-30) within 10 days. Thus, it can be inferred that spill-contact risk to important marine mammal habitats decreases with distances from the proposed sale area but that oilspill entry into major northern Bering Sea marine mammal habitats would be of moderate to high likelihood. It should be noted that the simulated seasonal trajectory periods were different and longer than the periods of most likely peak abundance of marine mammals near the proposed sale area (May-June and November-December). Therefore, although the latter probabilities may not provide an accurate estimate of absolute risk levels applicable to more restricted periods, they suggest strongly that spills are likely to occur in important habitats. Areas immediately west of the proposed sale area, and north of St. Lawrence Island, are important feeding and late winter habitat of bearded seals, as well as walrus (Graphic Nos. 5B and 5C). It should be noted that if a spill occurred in the southwestern-most tracts of the proposed sale (locations P1 and P2, Fig. IV.A.4.c.-1), there is a 45- to 50-percent chance that within 10 days offshore areas immediately to the west would be hit (Appendix J, Table 2, mid-boundary target No. 4) and a 7- to 27-percent chance that oil would move south of the simulated area boundaries (Appendix J; Table 4; segments 31, 32, and 33) toward drift ice and important marine mammal habitat of the east-central Bering Sea.

As discussed in Section III.C.4, large numbers of beluga whales may also occur on a seasonal basis near the proposed sale area. So little is known about their specific sensitivity to oilspills, that it is impossible to predict accurately the extent of potential impacts on this species. Indirect effects are probably only likely to occur on a localized basis. Relative vulnerability of the coastlines of Norton Sound suggests locales where food sources of this species may be affected (see Sec. IV.B.2.b., Impacts on Fish Resources), but since the bulk of the beluga population is only transient in the Norton Sound vicinity, it is unlikely that effects associated with the proposal would have significant, population-wide impacts on this species. As shown in Appendix J, Table 15, the Moses Point vicinity of Norton Bay is at little, if any, risk of oilspills; therefore, there is little likelihood that oilspills could affect the suspected beluga calving area. Since major population segments of polar bears and other marine mammals are not known to occur near the proposed sale, it is unlikely that spills associated with the sale would have significant direct impacts on them. Short term, indirect effects as may be associated with displaced seal populations may be sustained by polar bears, however.

As concluded for endangered species (Sec. IV.B.2.e.), it is not possible to predict with accuracy the ultimate impacts on marine mammals that may be associated with risk estimates discussed above. Although it is likely that spills associated with the proposal could move toward an important breeding habitat of, for example, bearded seal or walrus, the likely magnitude of various direct and indirect effects remain unknown. The probability of smaller spills dispersing and otherwise becoming of little consequence increases as the period of trajectory increases. Therefore, it is unlikely that most spills associated with proposed sale 57 would be of major, long term, or regional consequence to marine mammals. It is likely that avoidance of offshore habitats by seals or walrus (if such behavior would occur) would be of temporary duration and last no longer than the presence of oil. Permanent (multi-year) abandonment of offshore ice or open water habitat in response to

spills would be unlikely, given the number of seals and walrus that move through the proposed sale 57 area that are capable of reoccupying affected locations, as well as the high probability that oil would disperse. However, it is unknown how bottom-feeding marine mammals may react to areas where sedimentation of oil has occurred and, thus, the possibility remains that walrus and/or bearded seal may be more likely than other species to consistently avoid specific locales. The remote possibility exists that a very large spill associated with the proposed sale could occur and impact extensive population segments of marine mammals, especially if the spill occurred during migratory periods. Such effects could conceivably be in the form of direct mortality of young seals or widespread disruption of normal migratory patterns. In the proposed sale area, such disruptions could reduce at least one year's annual recruitment of important populations such as ringed seal, bearded seal, and walrus and could have undesirable consequences to subsistence users (see Sec. IV.B.1.c.).

As discussed previously, noise and disturbance associated with offshore operations may affect marine mammals. As shown in Graphic No. 5B, extensive shore fast ice areas, and therefore potential breeding habitat of ringed seals, occur around the southern and eastern coastline of Norton Sound, as well as some of the southern blocks of the proposed sale area. Therefore, to the extent that on-ice geophysical exploration would occur and would continue to occur in ringed seal breeding habitat during breeding periods as development and production phases progress, it is possible that such disturbance could have significant, long-term impact on ringed seal populations of the Norton Sound area. Although most geophysical exploration (especially vessel supported) may occur during pre-sale phases or in open water areas, there is at present no information available to adequately assess on a spatial basis the relative significance of post-sale disturbance of this nature, nor to assess how such disturbance may impact regional ringed seal abundance. Also, although impossible to quantify with precision, movement of ice-breaking tankers associated with the proposed sale through the ice front and drift ice of the east central Bering Sea and proposed sale area could disturb seals and walrus at sensitive reproductive periods. Breeding spotted and ribbon seals concentrated at the ice front may be particularly vulnerable to disturbance associated with ice-breaking vessels, and such disturbance could result in fatality of young animals or habitat abandonment in the immediate vicinity of tanker routes. Walrus and bearded seal throughout drift ice may be similarly affected. Ultimate significance to these populations would vary, depending on the frequency of such traffic, size of vessels, and behavioral tolerance of the species potentially affected. If the acute zone of influence of ice-breaking vessel traffic would be measured in the hundreds of yards to either side of such a vessel, only a minor portion of potential sea and walrus habitat would be affected. However, the validity of such an assumption is unverified and may be erroneous. In consideration of the potential for industrial noise and large vessel noise to penetrate to great distances underwater, it is possible that noise associated with tanker traffic, especially during winter periods, could create a broader zone of impact, and which, over the long term, could have more significant impacts on marine mammals. However, it is impossible to quantify such impacts at this time.

If support and supply aircraft associated with the proposed sale area travel very close to hauling areas, it is likely that spotted seals and walrus would be disturbed. Spotted seal hauling areas west of Cape Nome and walrus haulouts

on Sledge Island may be particularly vulnerable to aircraft traffic associated with the proposed sale. Although other species, other than those mentioned immediately above, may be affected directly or indirectly by oilspills and disturbance associated with the proposed sale, it is unknown to what extent or how significant such effects may be. For killer whales, certain porpoises, and sea lions, impacts would be minimal since only minor portions of these populations (see Sec. III.C.4.) occur in or near the proposed sale area.

Conclusion: Localized direct and indirect short-term contact between marine mammals and oilspills may occur, but are generally unlikely. If spills occur during periods of peak spring and fall migrations, a relatively high probability of oilspills moving into offshore areas west of the proposed sale area suggests that substantial adverse effects on major population segments of walrus, bearded seal, spotted seal, and beluga whale are possible. Such effects could entail temporary change in distribution, potential loss of juvenile animals, or disruption of food supplies. However, long-time significant regional impacts from the proposed sale are generally unlikely.

Effect of Mitigating Measures:

Information to Lessees Bird and Mammal Protection is the most effective protective measure available to this agency (DOI) by which sensitive concentrations of mammals at coastal hauling areas can be protected from behavioral disturbance due to aircraft or vessels, especially concentrations which are not located within the confines of the proposed sale area but which may still be affected by associated industrial support and supply activities. It is assumed that voluntary compliance with this Information to Lessees would be sufficient to minimize and eliminate most sale-related disturbance due to vessels or aircraft sources in the immediate vicinity of the proposed sale. (See Sec. II.B.1.c.).

Appropriate authorities may issue specific regulations under existing legislation (e.g., Marine Mammal Protection Act of 1972 and Endangered Species Act of 1973) which could further minimize behavioral disturbance of wildlife. Information to Lessees (Bird and Mammal Protection) suggested in Section II.B.1.c. is unlikely to be effective in minimizing behavioral disturbances associated with the proposed sale, but which may occur distant from it, e.g., potential disturbance of breeding seals near or at the ice front due to ice-breaking tanker traffic. Information to Lessees (Bird and Mammal Protection) does not mitigate impacts that may be associated with geophysical exploration, especially underwater noise or vibration which may occur on lease tracts, but which may affect adjacent areas during important reproductive seasons. Appropriate authorities designated by the MMPA would address such impacts on a case-by-case basis, and as presently done during permit review procedures.

Seasonal Protection of Marine Mammals from Effect of Oilspills: During preparation and review of the DEIS, the option of applying the seasonal drilling measure to the entire area was analyzed. While this would offer a small amount of extra protection to the entire area, it was felt the measure was more appropriate for the western most blocks. The Secretary may modify the wording of any stipulation prior to the final sale notice.

As discussed above, and as shown in the Oilspill Risk Analysis Model outputs, in the unlikely event of a large spill during peak migratory periods, there is

a relatively high probability that such a spill would move into offshore areas of the northern Bering Sea and potentially impact large assemblages of non-endangered marine mammals, especially walrus and ice-associated seal populations. As portrayed for sea ice chacteristics by Burns et. al. (1980) and Stringer et al. (1978), as evidenced by 24-hour oil trajectory predictions plotted by Liu (1981:Figures 1-3), and as discussed in the report of an interdisciplinary group convened during the Norton Sound Synthesis Meeting, October 28, 1980 (Burns, in press), a relatively well defined but variable boundary zone between the Norton Sound and a more oceanic province of the northern Bering Sea exists. This boundary roughly extends across the mouth of Norton Sound southward from Sledge Island toward the south mouth of the Yukon River. Drift velocity of ice (during winter and transition periods) to the west of this boundary are up to four times as great as those of the inner Sound. Movements of ice floes in excess of 25 miles (40 km) per day are likely west of the boundary zone (Burns, in press:25). Therefore, rapid transport of unweathered and undispersed oil into sensitive offshore areas to the northwest or southwest of the proposed sale area is most likely for blocks which straddle, or are found west of, this approximate boundary zone (Fig. II.B.1.c.-1). Near or in the identified blocks (see the potential mitigating measure on seasonal drilling restriction, Sec. II.B.1.c.), and during certain seasons, it is likely that marine mammals would be directly affected by unweathered or undispersed oil, and it is likely that oilspill-control efforts would be ineffective (in the event of a spill). At present, it is unlikely that a large spill could be controlled within this area when large, rapidly moving ice floes would be present.

Not only can this area of rapid surface transport be relatively well defined, but general periods of peak abundance of marine mammals in the vicinity are also relatively well known. Mammal species are present to a variable extent nearly all year long, but greatest numbers and major non-endangered population segments (walrus and ice-associated seals) are present particularly during May-June and November-December. Restriction of exploratory drilling to periods of minimal marine mammal occurrence in the blocks listed may substantially reduce the chance that impacts on major population segments would occur in the unlikely event of spill occurrence. As discussed previously, if spills occur in such blocks, there would be a relatively high probability of hitting important coastal marine mammal habitats on eastern St. Lawrence Island and the Punuk Islands. Also, there is a 15- to 27-percent chance that spills originating at western points P1 and P2 would hit sea segment 31 (between St. Lawrence Island and the mainland), as opposed to only a 5-percent chance associated with eastern source points P4, P5, and P6 (Appendix J, Table 6). Although spills originating in more eastern blocks are also likely to move into oceanic areas, increased weathering times could substantially reduce the potential impacts of those spills as compared to those which would originate further to the west. Therefore, if a seasonal drilling restriction were adopted, it would be less likely that large numbers of non-endangered marine mammals which migrate or assemble in the immediate vicinity of westernmost tracts would be directly affected by oilspills. In the absence of such a measure, such impacts would be more likely.

Cumulative Effects: For the purpose of this discussion, "cumulative effects" refers to the sum of direct and indirect oilspill effects, disturbance effects, habitat degradation due to petroleum industry or non-petroleum industry sources, and other factors potentially affecting marine mammals. Various

industrial effects are assumed to be similar qualitatively to those discussed previously. Factors which may produce cumulative effects on non-endangered marine mammals include the projects listed in Section IV.A.8., other federal OCS proposed or future lease sales, international fishing vessel activity, and subsistence or other harvests. It is unknown how extensive cumulative direct effects of oilspills associated with the various proposed state and federal lease sales due to oil and gas production or transportation would be in terms of ultimate population response of marine mammals or how the proposed sale(s) may contribute proportionately (incrementally) to total cumulative impacts. In the course of their migrations, walrus; bearded seal; spotted seal; beluga whale; and, to a lesser extent, ribbon seal population segments may be expected to travel through or proximal to several proposed oil and gas lease sales. Consequently, risks of oilspill impacts may be increased. Oil tankers associated with several sales would increase oilspill risks in areas of more intense traffic, such as may occur in the Bering Strait. Cumulative behavioral disturbance due to tanker traffic, seismic exploration, gravel island construction, pipeline construction, support and supply aircraft disturbance, fishing vessels, and other non-petroleum industry disturbance sources also may affect the behavior of such populations. Cumulative indirect effects such as may be associated with ingestion of contaminated prey, especially for benthic feeders such as walrus or bearded seal, are possible, but only as likely as the chance that substantial change in pollutant loads of the Bering and Chukchi Seas would occur. If several proposed sales were to yield large discoveries of oil and gas, intensive production activities (and resultant increase in pollution, localized shipping corridor disturbance, etc.,) could affect ice breeding seals, polar bears, walrus, or beluga whales directly. Specialized feeders such as walrus and bearded seal could be indirectly affected. Other factors such as future offshore fisheries harvests (e.g., via reduction or change in marine mammal food sources) may have as much or more incremental short-term effects on marine mammals than the proposed sale. At present, it is impossible to quantify the cumulative impacts except to identify them as possible types of effects.

Unavoidable Adverse Effects: The extent of unavoidable adverse effects associated with this alternative are unknown but would be limited to localized, short-term impacts due to oilspills or localized but presently unidentified potential effects of disturbance.

e. Impacts on Endangered Species: Major impact-producing agents affecting endangered cetaceans and birds could be oil and gas pollution, noise or other disturbance, and habitat losses.

Endangered Species Consultation: According to the requirements of the Endangered Species Act of 1973, as amended, formal Section 7 endangered species consultation of the Bureau of Land Management (BLM) with National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) was conducted on June 25, 1980, regarding exploratory phases of the proposed oil and gas lease sales in the Bering Sea. Informal consultation with appropriate officials was also conducted prior to and subsequent to the latter meetings. Consultation will continue as necessary. On August 22, 1980, a biological opinion (Appendix E) was received from the FWS regarding potential effects of exploration activities on endangered birds. In this opinion, in which it was concluded:

> "Since nesting and migration areas are relatively distant from the project area and the potential for an oilspill resulting from exploration activities is small, it is my biological opinion that the proposed oil and gas leasing and exploration activities associated with proposed OCS Sales 57, 70, 75, and 83 are not likely to jeopardize the continued existence of the listed species considered herein, and because there is no designated Critical Habitat within or near the project area, Critical Habitat will not be affected."

Formal consultation with NMFS on endangered whales began June 25, 1980. As per agreement between NMFS and BLM, an extended response period was necessary to prepare the biological opinion (Appendix G) on the effects of exploration activities on endangered whales. The following material describes potential types of effects on endangered species and rare plants, and provides site-specific (proposed sale 57) analysis on the occurrence of such effects.

Cetaceans--Direct and Indirect Effects of Oil and Gas Pollution: There is little if any evidence that endangered cetaceans are able to detect hydrocarbon pollution. Accounts from past oilspills show that marine mammals such as seals and sea lions may not avoid oil; however, there has yet to be found a confirmed case of a whale, dolphin, or porpoise coated or fouled with oil (Geraci and St. Aubin, 1979) as a result of contact made while alive. Toothed whales may be more likely to detect oil due to certain sensory capabilities (Geraci and St. Aubin, 1980). Goodale et al. (1981) observed endangered baleen whales surfacing on oil slicks in Cape Cod, Massachusetts). Although the direct effects of oil on cetaceans has not been observed, the nature of their skin suggests that they may be vulnerable to effects of surface contact with hydrocarbons (Geraci and St. Aubin, 1979). The epidermis is not keratinized, but composed of live cells (Geraci and St. Aubin, 1979). Geraci and St. Aubin (1979) reported that cetacean epidermis is virtually unshielded from the environment and may react to substances such as crude oil or gas condensates in a manner similar to sensitive mucous membranes.

Field observation of at least one instance of possible contact of gray whales with spilled oil did not show evidence of extreme effects. In 1969, the entire northward migration of gray whales passed through or near the area contaminated by the Santa Barbara Channel spill, yet the number of gray whale strandings was not significantly different from previous years (Brownell, 1971). Gas chromatograph analysis of tissues of a gray whale stranded in the vicinity of the spill did not indicate the presence of crude oil.

In addition to potential cutaneous contact with oil (or gas), inhalation of toxic substance or plugging of blowholes by oil have been cited as possible threats to cetaceans. Certainly the former is a possibility to the extent that whales may be in the vicinity of a spill prior to the evaporation of toxic compounds. The latter event would be very unlikely to occur. The typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inspiration and an abrupt closure of the blowhole (Geraci and St. Aubin, 1979). This mechanism prevents inhalation of water and should be discriminatory of gas condensates and oil; however, toxic hydrocarbon gas could be inhaled. The effects of gas condensate or gas vapor inhalation on cetaceans are unknown.

Cetacean vulnerability to hydrocarbon ingestion would vary with species, type of hydrocarbon, and nature of the spill. Tomilin (1955) reported that cetaceans, especially benthic feeders, have a poorly developed sense of taste, and the presence of foreign bodies in cetacean stomachs attests to this. Thus, whales may not be able to differentiate between hydrocarbon-contaminated and uncontaminated food. Gray and bowhead whales, which have been observed in and near the proposed sale area (Graphic No. 6A), are the endangered whales most likely to be affected by direct contact with or ingestion of pollutants as a result of the proposed sale. Another potential direct effect of spilled oil on certain whales is that of fouling of baleen, with a subsequent decrease in feeding efficiency. The probability of such fouling and effects on feeding efficiency is directly linked to probabilities of spills and whale contact with such spills. Preliminary results of ongoing experimental research suggests that oil, under controlled conditions, may reduce filtering efficiency of bowhead baleen (Braithwaite, 1980). However, it is not possible to predict eventual population response on endangered whales as a result of baleen fouling at this time. Effects of bioaccumulation of toxic substances in cetaceans are not well understood.

Of possible indirect impacts from oil and gas activities, reduction of food sources from acute or chronic hydrocarbon pollution is of greatest concern. Most of the baleen whales of the north Pacific are seasonal feeders, relying almost entirely on the abundant food sources of the Gulf of Alaska, Bering Sea, and Arctic Ocean for nourishment, as well as living off stored blubber reserves while migrating and in their winter range. The destruction of benthic amphipods or altered productivity of benthic communities may adversely affect gray whales, possibly forcing some whales to enter their wintering areas with insufficient or lowered energy reserves. As discussed in Section III.C.6., areas near the proposed sale (Graphic No. 6A), especially the Chirikov Basin, are of major importance to gray whales feeding extensively on benthic food sources, primarily amphipods. Evidence exists (e.g., Percy, 1976; Bellan-Santini, 1980) showing that certain amphipods and their community structure or function may be affected by pollution. However, at present, data are not available to verify exactly how much of a reduction in localized amphipod productivity would result, if at all, in an adverse population response of gray whales. Thus, for gray whales, indirect effects through food resources can be considered a possibility; and their probability can be directly related to probability and future extent of pollution events. Catastrophic or chronic pollution which affects major benthic areas would be most likely to lead to noticeable impacts on gray whales as opposed to minor, restricted, impact-causing events. Since bowhead whales do not feed extensively in the proposed lease sale area, indirect food-chain-related effects on this species due to the proposed sale are unlikely. Similarly, since they are less restricted in feeding habits and not numerous in the proposed sale area, it is unlikely that other populations such as humpback, fin, or sei whales would be adversely affected through impacts on food resources, although individual whales may experience indirect effects on a localized or temporary basis.

Local or temporary contamination or chronic pollution resulting in reduced productivity of plankton or other important food items may be an additional stress to endangered whale populations. The extent to which physiological stress resulting indirectly from oil pollution may affect endangered whales or interact with other stressors is highly debatable, and any prediction of

stress-related impacts of oil pollution on endangered whales would be premature.

Cetaceans--Noise and Disturbance: See Section IV.B.2.d. for general information on underwater noise sources and characteristics. The response of animals to acoustic stimuli has generally shown variance in behavioral and physiological effects, dependent on species studied, characteristics of the stimuli (e.g., amplitude, frequency, pulsed or non-pulsed), season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, and other factors.

Research on effects on noise, particularly that associated with oil operations on endangered cetaceans, has been limited. Presently existing field observations of responses of cetaceans to disturbance provide some index of sensitivity of whales to noise and disturbance. For example, with respect to the gray whale in southern California, Dohl et al. (1978) concluded that "The reasons for this apparent increase in utilization of offshore waters are unknown, but might be the result of increased human activity in the Bight, increased gray whale numbers, or some combination of both factors." There are no confirmed reports or documented evidence of the latter species actively and consistently avoiding exploratory or production platforms, helicopters, seismic operations, or other OCS activity; in fact, numbers of gray whales nearshore along the California coast have remained relatively stable in spite of human activities, including oil exploration (personal communication, T. P. Dohl, University of California at Santa Cruz, 1980). Reeves (1977) identified potential conflicts of disturbance sources and breeding gray whales in Baja, California. Subsequently, Swartz and Jones (1978) reported that although boat traffic in the Laguna San Ignatio (a gray whale breeding habitat) increased 30 percent over the previous season, boat activity did not affect large scale movements or distribution of gray whales. Although localized avoidance behaviors were observed, gray whales became accustomed to boat traffic as the period of exposure to such disturbance increased (Swartz and Jones, 1978). Geraci and Smith (1979) concluded that species such as the gray whale seem to coexist well with human activities, and most animals become accustomed to low level background noise such as that associated with most ship traffic and petroleum activities. Shipping records show that more than 28,000 vessels arrive in coastal waters of northern and central California each year in the southern portion of the gray whale range. (This figure does not include arrivals at the major port of Los Angeles.) At least 7,263 marine fishing vessels were registered in California in 1976-1977 (Oliphant, 1979); and probably more than 24,000 marine fishing vessels operate throughout its range in Alaska, Washington, Oregon, and California (U.S. Department of Commerce, 1973:270). Additionally, large numbers of recreation boats and other sources of underwater noise also subject this species to noise effects. (See Section IV.B.2.d.) In spite of the large amount of acoustic energy introduced throughout their range, gray whale population recovery has been dramatic. In short, evidence to date suggests that the gray whale population has not responded adversely to existing sources of disturbance and, therefore, may not be particularly sensitive to many types of noise associated with offshore petroleum industry operations. However, little definitive data exists to verify that migratory or feeding behavior of gray whales would be unaffected by disturbance in areas previously devoid of factors such as drilling, seismic exploration, or helicopter traffic.

Other endangered whales may be more sensitive to noise and other disturbing factors. NMFS Biological Opinion (Leitzell, 1979) concluded that "Uncontrolled increase of vessel traffic, particularly of erratically travelling charter-use/pleasure craft, probably has altered the behavior of humpback whales in Glacier Bay, and thus may be implicated in their departure from the bay the past two years." However, other factors may also have affected humpback use of the latter area. Evidence of humpback sensitivity to disturbance has been reported in its wintering grounds (Norris and Reeves, 1978). However, Payne (1978) listed numerous instances of apparent insensitivity of humpback whales to noise. Preliminary field experiments on bowhead whales showed statistically significant differences in behavioral parameters as a result of nearby boat activity, including decreased time spent at surface, decreased number of blows per surfacing, increased spreading out of grouped animals, and significant changes in directional orientation (Fraker et al., 1981). However, flight responses seemed to be of brief duration. Bowhead whales tended to move away from boats which approached within 1 kilometer (0.62 mi) and were observed reacting to boats at distances as great as 3.7 kilometers (2.3 mi). Bowheads overflown by fixed-wing research aircraft seemed more sensitive than certain other species. To minimize disturbance, altitudes of about 450 meters were maintained by Fraker et al. (1981). Diving responses to aircraft at lower altitudes (observed by Fraker et al., 1981) may have been associated with factors other than noise alone, although the latter workers recorded relatively large amounts of noise entering the water from aircraft.

Loud noise is not unusual in the marine environment. Some species of baleen whales may vocalize at source levels exceeding that of natural ice-related noise. A single observation by Fraker et al. (1981) of bowheads in the vicinity of active seismic operations (source levels ranging from 220-270 db [see Appendix G]) did not indicate unusual behaviors; however, this observation does not constitute sufficient data upon which to draw a conclusion regarding the significance of disturbance due to geophysical (seismic) exploration. Therefore, until further information is obtained, the latter source of disturbance could be considered as a factor which may possibly affect bowhead whales adversely. This source of disturbance may be of particular concern due to a zone of influence of noise above ambient levels potentially of a radius in the hundreds of miles. As for seismic operations, bowheads have been observed close to offshore artificial islands and operating dredging equipment, but sufficient data is lacking at this time to conclusively evaluate the response to such disturbance. In the proposed sale 57 area, possible acoustic effects on bowheads would be most likely during the spring and fall migration periods (see Sec. III.C.6).

Probably of major significance to endangered cetaceans which may occur near the proposed sale area is interaction of noise with other visible phenomena, or previous experience in terms of ultimate behavioral and physiological responses. It will remain difficult to predict behavioral or physiological responses of large cetaceans to disturbance and noise even those types of disturbance which are consistently associated with oil and gas development. As for other impact-producing agents, there is some speculation about the possible induction or contribution to physiological stress on cetaceans which may result from sustained noise or disturbance. Such an impact could affect reproductive rates, resistance to disease, or endocrine balances of individuals. The extent to which disturbance due to oil and gas exploration and development in the

proposed sale area would act as a stressor is uncertain, and any prediction of the extent of stress-related impacts of noise would be premature.

Other potential influences on cetaceans include marine disposal of drilling muds, formation waters, and cooling waters; shoreline alterations; facility siting; dredging and filling; and secondary development. The extent of these activities during exploration should not be a major influence on endangered or other cetaceans. Decreased whale productivity could be sustained as a result of loss of habitat or habitat deterioration occurring during development. These effects would be localized, although incremental losses could be significant to the extent that the overall summation of regional effects would deteriorate available or important habitat. (See the following discussion on cumulative effects.)

Peregrine Falcon: The factor most likely to affect the peregrine falcon would be effects associated with uncontrolled airborne noise and disturbance--especially noise and disturbance associated with supply aircraft serving offshore facilities and potentially passing close to nesting sites. Disturbance from such sources could reduce the survival of nestlings. Construction of onshore facilities near peregrine nesting sites could also be a potential source of disturbance. Although relatively unlikely, oilspills may also impact-peregrines either through direct contact by adults (when hunting or via prey caught in the vicinity of the spills) or indirectly through disruption and loss of prey organisms. Probability of such effects is directly related to probability of the spills in the vicinity of peregrine nesting areas. (See the following discussion on Site-Specific Impact Risk for Endangered Whales and the Peregrine Falcon.)

Rare Plants: Facility construction or material acquisition may directly affect species described in Section III.C.6., especially the walpole poppy and the arctic sage (which may occur near Cape Nome construction sites). However, lack of knowledge of precise locations of such activity makes more detailed analysis of little use at this time. Although not presently justifiable, surveys could be performed to determine if such species occur in potential construction or extraction sites. Endangered Species Act, Section 7 consultation between appropriate federal agencies may address potential effects of exploration, development, or production stages on endangered plants, as necessary, and if such plants would be listed as threatened or endangered.

Site-Specific Impact Risk for Endangered Whales and the Peregrine Falcon: Endangered whales most likely to occur in or near the proposed sale area include gray, bowhead, fin, humpback, and sei whales (Sec. III.C.6.). If a spill occurred in the southwestern blocks of the proposed sale area (Fig. IV.A.4.c.-1, location P1), there would be a 52-percent chance that it would contact a portion of the Chirikov Basin gray whale feeding area (Appendix J, Table 2, Gray Whale Area) within 10 days. (See Graphic No. 6A for delineation of the entire feeding area.) If spills occurred at certain points along a possible tanker route in upper Norton Sound (Fig. IV.A.4.c.-1, locations P16, P17, P19, P20), they would intersect this area within 10 days with a chance of a 62-percent to greater than a 99.5-percent probability (Appendix J, Table 2). Important gray whale feeding areas near eastern St. Lawrence Island are at relatively less, but still a substantial risk, if spills occur along such a tanker route (Appendix J, Table 5, 5- to 51-percent chance in a 10-day period, locations P16, P17, P19, P20; segments 30, 31), or in the southwestern-most

blocks (Appendix J, Table 5, 7- to 27-percent chance in a 10-day period, location P1, segments 30, 31). Spills originating in inner Norton Sound would pose considerably less risk to the gray whale feeding area in eastern St. Lawrence nearshore habitats. Appendix J, Table 2, shows that the Gray Whale Area would be hit by spills at a 15- to 35-percent probability, within 10 days, if they originated at locations P4, P5, or P6.

If development occurred to the extent estimated herein (Sec. II.A.), and if associated spill rates occurred (Samuels and Lanfear, 1981), the probability of spills hitting a portion of the gray whale feeding area within 10 days is 75 percent for spills greater than 1,000 barrels and 47 percent for spills greater than 10,000 barrels (Appendix J, Table 7). As pointed out by Samuels and Lanfear (1981), if the field is developed, segment 30 (which contains the eastern tip of St. Lawrence Island) has a high (33- to 38-percent) chance of contact by spills greater than 1,000 barrels within 30 days (29-percent chance within 10 days). It was assumed (Section II.A., Samuels and Lanfear, 1981) that gas is present in the southern blocks and that oil is not. In the unlikely situation that oil would be found therein, risks to segments 30-34 would probably be greater. As illustrated herein, the area bounded by segment 30 is an important gray whale feeding area as well as a possible, although presently unimportant, bowhead migratory corridor. Therefore, in the event of development, there is a relatively high probability that spills may move into the gray whale feeding area or portions of the area. The ultimate impact on the species as a result of direct and indirect effects of oilspills (see the preceding discussion on Direct and Indirect Effects of Oil and Gas Pollution) would vary depending upon the volume of oil spilled, the amount of oil reaching the ocean bottom, the extent of weathering of oil, the proportions of total feeding area affected, whether whales are present, and other factors. Direct effects such as fouling of baleen, ingestion or cutaneous uptake of hydrocarbons, or tissue injury may occur if whales cannot avoid spilled oil. In general, widespread direct and indirect effects of oilspills on gray whales are only as probable as large, catastrophic oilspills, i.e., such effects are very unlikely. However, given the above enumerated probabilities of spills intersecting gray whale feeding areas (assuming development as described in Sec. II.A.), it is very likely that direct or indirect interaction (of indeterminate degree) of gray whale feeding habitat and oilspills would occur as a result of the proposal. This interaction could be manifested by at least temporary avoidance of affected areas by gray whales or short term, localized reduction of productivity of benthic organisms, assuming toxic or destructive fractions of spilled hydrocarbons affected benthic areas. It is unlikely that the interactions mentioned above would have significant long-term, regional impacts on gray whales since large, destructive spills are unlikely; but localized effects of lesser spills are more likely.

A potential site of interaction between bowhead whales and oilspills would be in the Bering Strait region. Appendix J, Table 15, shows that over the life of a development field, the probability of spills greater than 10,000 barrels passing north of the area delineated by segments 24-26 is 0- to 6-percent and 0- to 13-percent (greater than 1,000 barrels), given a 10-day trajectory period. Therefore, there is low to moderate probability that spills would get as far as Cape Wooley in 10 days, and an even lower probability that spills would reach the strait and become a potential disturbance to migrating bowheads. However, movements of spills westward toward major bowhead migratory corridors may be somewhat more likely as indicated by a 17- to 23-percent

chance of contact within 10 days for segments 27-29 (Appendix J, Table 15). The probability of spills moving west of 169° W. longitude and into major bowhead migratory corridors is probably lower, however, due to the distance involved. Similarly, movement of spills to the southwest toward bowhead wintering areas is a 4- to 21-percent likelihood (Appendix J, Table 15, segments 31-33). The likelihood is possibly higher in the unlikely situation that oil would be found in southern blocks (e.g., near locations P1, P2). Indirect impacts on the bowhead whales as the result of spills associated with the proposal are even less likely than those that may occur for gray whales, since bowhead neither feed nor dwell in the immediate vicinity of the proposed sale for extended periods. Nevertheless, tanker traffic associated with the proposal could be a source of spilled hydrocarbons which may affect bowheads during their wintering period in the Bering Sea south of St. Lawrence Island. Transient and probably minor segments of sei, humpback, or fin whale populations may be expected to be vulnerable to tanker-associated spills during summer months. Significant population-wide oilspill impacts on sei, humpback, or fin whales as a result of the proposed sale are unlikely.

Of the major project phases (exploration, development, and production), the development phase of the proposal would probably generate the greatest amount of noise and disturbance which could be transmitted into the whales' environment (see Sec. II.A.). Disturbance responses due to supply boats, air traffic, gravel island construction, dredging, etc., would be most likely during this phase. Sale-related noise from tanker traffic, drilling, or geophysical exploration may be substantial in other phases as well. If the relative tolerance demonstrated by gray whales elsewhere in their range (see above discussion) is used as an index, disturbance due to activities associated with the proposed sale are unlikely to significantly affect gray whales. Since it is likely that major portions of the bowhead population, either breeding or with calves, may be well within the range of sale-related disturbance (especially that of geophysical activity or ice-breaking tanker traffic activities), and since relatively little is known about bowhead whale tolerance to various types of disturbance, it is possible that this species could be affected detrimentally by disturbance. As discussed above, certain types of underwater noise may travel hundreds of miles before weakening. Thus, during winter (January-March) or migratory periods (November-September, April-May), noise from activity on leased tracts or tanker traffic may penetrate areas occupied by bowheads. This could lead to presently indeterminant change in species distribution and/or productivity. At present, it is difficult, if not impossible, to determine how significant such impacts on the bowhead could be or to evaluate how sale-related noise and disturbance may compare to other similar sources. It is unlikely that disturbance of benthic fauna due to construction of pipelines in the proposed sale area would have significant impact on the endangered species. It is unlikely that significant, population-wide impacts on sei, humpback, or fin whales would occur as a result of disturbance due to the proposed sale.

In general, since the degree of offshore activity associated with the exploration phase of the proposed sale is relatively minor (averaging about three drilling rigs per year), and since spills during this phase are very unlikely (as low as a 0.09-percent chance, Danenberger, 1980), then it is very unlikely that sale-related activities associated with the exploration phase would significantly impact endangered whales.

Examination of the probability of spilled oil hitting certain land segments provides approximate measures of risk to the two most likely nesting sites for peregrine falcons in the proposed sale area, Sledge Island (near segment 23, Fig. IV.A.4.c.-2) and the Topkok Head vicinity (segment 19, Fig. IV.A.4.-2). Appendix J, Table 5, shows that there is a moderate (11-percent) chance that a spill could hit the Topkok Head area in 10 days, if it originated at location P7 (i.e., a pipeline originating in an eastern tract). If spills originated at most points in the proposed sale area (Appendix J, Table 5, locations P1 to P20), there would be little (less than a 5-percent) chance of the spills hitting land at or near Sledge Island (segments 23 and 25, Fig. IV.A.4.c.-2).

If development occurred to the extent estimated herein (Sec. II.A.), and if associated spill rates occurred (Samuels and Lanfear, 1981), Appendix J, Table 15 indicates that the probability of spills hitting near Sledge Island or Topkok Head areas (segments 19 and 23) in 10 days is 5 percent or 6 percent, respectively, for spills greater than 1,000 barrels. Other land segments around the northern and eastern perimeter of the Sound, where peregrine habitat may exist, are also of low vulnerability. Therefore, it can be concluded that these locations are at relatively low risk of contact by spilled oil for either the assumed life of the field (Appendix J, Table 15) or conditional on assumed occurrence of spills at source locations as detailed in Appendix J, Table 2. Therefore, direct effects of peregrine falcons associated with spilled hydrocarbons are unlikely. As shown in Appendix J, Table 7, large seabird foraging areas near these sites are at moderate to high risk of spills, suggesting that indirect food-chain impacts may be of somewhat higher probability than direct effects. However, since it is unknown how extensively peregrines prey in the offshore areas delineated, it is impossible to determine if spills within these areas would be of significance.

Uncontrolled aircraft traffic near known or potential peregrine nesting sites (Graphic No. 6A) would be more likely to have a significant impact on peregrine falcons than oilspills. Such impacts could be in the form of decreased nesting success resulting from disturbance. However, compliance by lessees with recommendations made in the Information to Lessees (Bird and Mammal Protection, Sec. II.B.1.c.) is expected to minimize sale-specific impacts of this nature. Therefore, significant impacts due to oilspills or disturbance on peregrine falcons are unlikely in all project phases, assuming the suggested mitigating measures are adopted. Peregrine populations in the Norton Sound vicinity represent a very minor portion of Alaskan populations and, thus, the relatively unlikely impacts of offshore development would be even less likely to impact overall population trends.

Conclusion: It is very likely that there would be impacts on gray whale feeding habitat due to lesser oilspills. It is possible that this these impacts could be manifested by at least temporary avoidance of offshore areas or localized reduction of productivity of benthic gray whale food organisms. Although there are low to moderate risks that spills could move toward major bowhead migratory corridors, it is unlikely that such areas would be directly affected. Magnitudes of such effects cannot be quantified at this time. It is possible that bowhead whales could be affected detrimentally by disturbance on a short-term localized basis. It is unlikely that sale-related activities associated with exploration phases would significantly impact endangered whales on a long-term regional basis. Significant long-term regional impacts on peregrine falcons due to oilspills are unlikely during all project phases.

Effect of Additional Mitigating Measures: If the suggested Information to Lessees (Bird and Mammal Protection) is adopted, it is unlikely that peregrine falcons would be significantly affected by disturbance due to aircraft or vessel noise. The latter Information to Lessees is unlikely to be effective in reducing behavioral disturbance of endangered whales associated with the proposed sale due to associated underwater noise or vibration from geophysical exploration. Appropriate authorities designated by the Endangered Species Act will address such impacts on a case-by-case basis as presently done during permit review procedures. Certain suggested mitigating measures (Sec. II.B.1.c.) may reduce effects on endangered whales indirectly as such measures may change or reduce oilspill risks. The suggested seasonal restriction on exploratory drilling may reduce potential oilspill effects on migrating gray whales or early arrival of gray whales in the eastern St. Lawrence Island area. However, since many gray whales are present due north of St. Lawrence Island near the proposed sale area throughout the summer, the seasonal restriction would not reduce their vulnerability during summer months. Available data indicates that in spring most bowheads migrate around the western end of St. Lawrence Island and probably occur west of 168° W. longitude, where oilspill contact rates would be equal to or less than a 23-percent chance, even in the absence of the suggested seasonal drilling restriction. Extension of the drilling restriction to include the month of April would reduce the risk to bowheads which may occur in waters due north of St. Lawrence Island to an even lower level. The seasonal drilling restriction may reduce to some extent the risk of oilspills to fall migrating bowheads. See Section IV.B.2.d. for a discussion of the mitigating effectiveness of this suggested seasonal drilling restriction as it pertains to non-endangered marine mammals.

Cumulative Effects: For the purpose of this discussion, cumulative effects refers to the sum of direct and indirect oilspill effects, disturbance effects, potential reduction of habitat quantity or quality, or other factors such as subsistence harvest. Industrial effects are assumed to be similar qualitatively to those discussed previously. Factors which may produce overall cumulative effects on endangered species, especially whales, include those projects listed in Section IV.A.8., Canadian oil leasing in the eastern Beaufort Sea, other proposed or future federal offshore oil and gas lease sales, subsistence harvest, and other non-petroleum industry sources of oilspills or disturbance. Certainly of concern is the cumulative impact of oilspills or other pollution associated with the above-listed projects. It is unknown how extensive direct effects associated with proposed federal, state, or private lease sales on endangered whales or birds may be. Probability of such effects may increase if all the potential developments take place, especially for species such as gray and bowhead whales, which are known to migrate through several proposed sale areas. For example, bowheads move through or near areas which are existing or proposed federal lease sales such as the first joint federal/state Beaufort sale, proposed federal sale 71 (Beaufort Sea), proposed federal sale 85 (Chukchi Sea), and proposed sale 86 (Hope Basin). The species winters in the vicinity of proposed federal sale 83 (Navarin Basin) and summers in the immediate vicinity of Canadian oil and gas development. Cumulative indirect effects on gray whales may also occur if future development takes place in important feeding areas immediately to the west of the proposed sale 57 area. Also, gray whales travel near or through federal lease sales such as sale 53 (central and northern California coast), sale 55 (eastern Gulf of Alaska), and proposed sale 75 (North Aleutian Shelf). However, due to the extreme uncertainty regarding the extent of development in these areas and

regarding the probability of effects on endangered species, it is impossible to predict the type or magnitude of future cumulative pollution-related effects on endangered species. Cumulative spill effects may be greatest at locations where tanker traffic (due to several sales) may be focused, e.g., the Bering Strait or Unimak Pass. Due to the relatively reduced population status of the bowhead harvests, bowhead whales may affect short-term population dynamics as much as industrial impacts.

Cumulative acoustical disturbances associated with proposed state and federal lease sales may affect endangered cetaceans. The relative significance of disturbance due to proposed federal sales (as it compares to state, Canadian sources, or non-petroleum industry sources), is unknown. Although it is not feasible to predict with any accuracy the long-term and population-wide behavioral responses of cetaceans from cumulative noise, such preduction would have to take into account all noise sources throughout a species' range. It would also have to include all marine vessel traffic, all recreational vessel traffic, all sale and non-sale specific geophysical exploration activity, all aircraft, all pumping stations, all snow machines, all natural sources, etc. For some species such as the gray whale, OCS development may constitute only a minor portion of total acoustical stimuli. For bowhead whales which, at least until recently, have not been exposed to major industrial activity, cumulative OCS development may be of more significance. If several proposed sales yielded large discoveries of oil and gas, intensive production activities and resultant increases in human activity, increased localized or shipping corridor disturbance, increased pollution, etc., then the cumulative oilspills or disturbance could be significant for potentially sensitive or severely depleted coastal species such as the humpback or bowhead whales. Cumulative industrial disturbance, especially during migratory seasons, may be greatest at locations where tanker traffic due to several sales may be focused, e.g., the Bering Strait. As suggested previously, long term, ecosystem-wide cumulative effects of chronic pollution may be of concern since change in total ecosystem productivity is at least a remote possibility. However, it is unknown how such an impact may ultimately affect endangered whales.

Cumulative impacts of disturbance may affect peregrine falcons frequenting the proposed sale area. Disturbance during the exploration, development, and production phases of the proposed State of Alaska oil and gas lease sale may occur since geophysical exploration, aircraft disturbance, or other human activities associated with that sale could occur very close to potential peregrine nesting habitat. However, such impacts can be minimized by appropriate restriction of certain activities near nesting sites. The future extent of cumulative, indirect oilspill effects on peregrine falcons is unknown.

Unavoidable Adverse Effects: The magnitude of unavoidable impacts on endangered whales is unknown. In the event of development, the high probability of spill occurrence in certain areas indicates that gray whale feeding habitat may be affected in the form of at least a localized change in benthic communities structure or productivity. Noise and other forms of disturbance associated with the proposed sale (e.g., disturbance due to ice-breaking tanker traffic or sale-related geophysical activities) may cause temporary behavioral responses or long term change in species distribution and productivity. Such disturbance-related impacts would be most likely to occur to bowhead whales during periods when migrating (November-December, April-May) near the proposed sale area, or possibly during the wintering period if in the vicinity of

ice-breaking tanker routes. However, present knowledge of petroleum-related activity and its relationship to cetaceans is insufficient to predict the magnitude of many unavoidable adverse impacts on endangered whales that may be associated with the proposed sale. Unavoidable adverse impacts on peregrine falcons as a result of this proposed sale are likely to be minimal, if existent at all.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: The employment and other direct economic impacts of Bering-Norton OCS petroleum development on areas of Alaska other than the Nome census division are expected to be mild and, therefore, are not discussed in this text. However, employment and population projections for the state, with and without the Bering-Norton oil development, are presented for the years 1980 to 2000 in "Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models," November 3, 1980, prepared for the Alaska OCS Office by the Institute of Social and Economic Research, University of Alaska. That document provides similar projections for the Anchorage region, which serves as the trade center for most of Alaska.

Although employment and other general economic impacts outside the Nome census division resulting from Bering-Norton OCS development are expected to be minor, possible oilspills in Norton Sound could have significant adverse effects on the salmon fisheries of the lower and upper Yukon and on other wildlife resources of the Yukon Delta. The probability and degree of impact of possible oilspills on these resources are discussed in Section IV.B.2.a. The general conclusion which may be drawn from Section IV. B.2.a. is that the probability of significant oilspill impacts on the Yukon Delta is believed to be very low, but no precise determination of the probability of significant oilspill impacts is possible with presently available information. If sizeable quantities of oil should reach the shore of the Yukon Delta, there could be deleterious impacts on the commercial and subsistence fisheries of the lower and upper Yukon and on the Yukon Delta bird and marine mammal resources used for subsistence. While the extent of these impacts cannot be quantified, the adverse effects could persist for up to 10 years. As explained in Section III.D.1., the salmon resources of the Yukon are vital to the livelihood of Alaska Native (Eskimo and Indian) residents of the lower and upper Yukon, both for commercial and subsistence purposes. In addition, the bird and marine mammal resources of the Delta are important sources of food for Eskimo residents of the lower Yukon area. The value of all fish and wildlife resources harvested for subsistence by Native residents (Eskimos) of the Yukon Delta has been recently estimated at more than twice the cash income of the Native population of the region (Wolfe, 1979).

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): Employment impacts within the Nome census division resulting from the proposed lease offering are presented in Table IV.B.3.b.-1. Although the Nome census division includes 16 small communities scattered over the Seward Peninsula, St. Lawrence Island, and Little Diomede Island, all of the increase in employment is expected to occur in or near the city of Nome, except those jobs located offshore.

Table IV.B.3.b.-1

Wage and Salary Employment Effects of OCS Development - Mean Case

Nome Census Division

Note: Within the Nome census division, none of the new jobs resulting from OCS development would occur in the outlying communities. All new jobs would either be offshore or in the city of Nome, or in areas not far from Nome and connected by road to Nome.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Number of Jobs Resulting From OCS Activities					Total New Jobs (OCS and Non-OCS) Excluding Jobs Filled by Communters		
	Direct Employment in OCS Activities			All Other New		Filled By Persons		
Year	Commuters[1/] (Non-Residents)	Current Residents	Total OCS Jobs	Jobs Caused By OCS Activities[2/]	Total Number Of New Jobs	Who Would Have Been In The Nome Area In The Absence of OCS	Filled By OCS In-Migrants[3/]	Total
1981	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0
1983	664	95	759	160	919	255	0	255
1984	1,408	59	1,467	271	1,738	309	21	330
1985	2,729	105	2,834	534	3,368	352	287	639
1986	2,385	88	2,473	705	3,178	333	460	793
1987	2,588	237	2,825	890	3,715	327	800	1,127
1988	2,912	346	3,258	1,135	4,393	371	1,110	1,481
1989	1,527	221	1,748	994	2,742	376	839	1,215
1990	1,077	113	1,190	639	1,829	317	435	752
1991	868	81	949	422	1,371	304	199	503
1992	801	81	882	319	1,201	310	90	400
1993	814	81	895	279	1,174	315	45	360
1994	832	81	913	268	1,181	320	29	349
1995	801	81	882	263	1,145	324	20	344
1996	799	81	880	256	1,136	329	8	337
1997	801	81	882	253	1,135	329	5	334
1998	814	81	895	253	1,148	330	4	334
1999	832	81	913	256	1,169	334	3	337
2000	801	81	882	255	1,137	334	2	336

1/ Figures in column 1 labeled "Commuters" represent workers recruited from outside the Nome census division who would fly to residences far removed from the Nome area during periods of rest and recreation. While on duty in the Nome area, these commuters would live in company dormitories either offshore or at a site outside the present city limits of Nome. Because these commuters would have a minimal impact on the local economy, they are omitted from projections of the Nome area population in Table IV.B.3.b.-2 and other tables in this section. For some purposes, the commuters are also excluded from projections of Nome area employment. Please note that figures in column 1 represent the number of commuters who are on duty on any given day. Those commuters who are absent from the Nome area during their periods of rest and recreation are not reflected in the figures in column 1.

2/ Jobs in the ALL OTHER category include jobs in transportation, communications, or other industry classifications in activities directly or indirectly related to OCS activities. Also included are jobs in retail trade or other industries which are created by the personal consumption expenditures of OCS workers, together with the indirect "multiplier" effects (i.e., when spending by OCS workers creates new jobs in retail trade, the new retail trade workers will themselves spend money which will create additional new jobs). Included also in the ALL OTHER category are additional jobs in government, such as additional school teachers, policemen, firemen, etc., made necessary by OCS development.

3/ OCS IN-MIGRANTS include all persons attracted to the Nome area due to improved employment opportunities resulting from OCS development activities. Figures in column 7 include in-migrants working in non-OCS jobs such as retail trade, transportation, or government, as well as in-migrants directly employed in OCS activities. Figures in column 7 include workers brought to the Nome area by the oil companies, as long as these workers actually reside in the Nome area, as distinguished from the commuters who reside out of the Nome area during periods of rest and recreation.

Source: SCIMP Model projections presented in Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models (Nov. 3, 1980).

Figures in column 1 of Table IV.B.3.b.-1 are for commuters, i.e., OCS petroleum workers recruited from outside the Nome census division who would fly to residences far removed from the Nome area during periods of rest and recreation. Commuters could reside outside Alaska, in Anchorage, or elsewhere in Alaska. Figures in Table IV.B.3.b.-1 reflect the assumption that nearly all commuters would, during their periods of duty in the Nome area, be housed in company dormitories either offshore or at an enclave outside the present city limits of Nome. The enclave would be connected to Nome by road.

The use of large numbers of commuters, and their housing in dormitories either offshore or at an enclave outside the present city limits of Nome, is an important assumption of the economic analysis presented in this document. (If all petroleum development workers were to reside permanently in the Nome area and were housed within the community, economic impacts would be far greater than those described in this analysis. However, such a pattern of OCS development is considered totally unlikely.)

Column 3 of Table IV.B.3.b.-1 shows that the direct employment impacts from OCS petroleum development activity would begin in 1983 with an increase of 709 jobs (including of commuters). During the next 5 years, OCS direct employment impact would increase rapidly, peaking at 3,258 jobs (annual average basis) in 1988, then dropping rapidly to less than 900 jobs in 1992. During the 1992 to 2000 period, OCS direct employment impact would remain nearly constant at about 900 jobs. These figures include not only direct employment in OCS-related activities but also the indirect employment impacts of OCS development (including jobs in transportation, retail trade, and personal services) and increased numbers of local government employees. However, all of these figures are exclusive of the commuters, who would reach a peak of about 2900 in 1988 and would remain at a level of about 800 during the years 1992-2000.

Columns 6 and 7 of Table IV.B.3.b.-1 divide the employment impact of OCS (exclusive of commuters) between jobs filled by persons who would have been in the Nome area in the absence of OCS development versus jobs filled by OCS in-migrants. The term "OCS in-migrants" includes all persons (except commuters) attracted to the Nome area due to the increased job opportunities resulting from OCS development. This group would include workers brought to Nome by the oil companies, provided that they would become permanent residents and would not be commuters. Figures in Columns 6 and 7 include not only direct employment impacts of OCS development, but also the indirect employment impacts of OCS development as projected by the SCIMP Model of the University of Alaska. Indirect employment impacts will include new jobs in retail trade and personal services created by the personal consumption expenditures of workers in petroleum related jobs. Also included will be additional jobs in air transportation, created by the large numbers of petroleum workers who will commute out of the Nome area during periods of rest and recreation. Other indirect employment impacts will include new local government jobs resulting from the population impacts of OCS petroleum development, as well as jobs in other categories which are created by various indirect effects of the presence of petroleum development activities in the area.

Because OCS in-migrants would live in Nome on a permanent basis and would probably live in ordinary housing in or near the city of Nome (rather than in company dormitories like the commuters), this group would have a very large impact on the local economy due to their personal consumption expenditures.

The OCS in-migrant job-holders and their dependents would also have a substantial impact on the population of the city of Nome and the immediate area, thereby generating increased demand for local government services. OCS in-migration would also include some unsuccessful job seekers, who would also add to the local population and demand for government services.

Figures in column 6 of Table IV.B.3.b.-1, viewed together with the total job figures, could be interpreted as indicating an upper limit of less than 400 on the number of employable local residents (i.e., persons ready, willing, and able to work) who would be jobless in the absence of OCS development. However, an important turnover factor is involved in these figures. Many residents of the 16 outlying communities of the Nome census division would be unwilling to leave their homes permanently but might be extremely interested in working one or more extended periods in OCS related jobs and then returning to their home communities. Therefore, the apparent limit of about 400 persons on the number of additional employable persons among the permanent area residents should be interpreted as the number available at a point in time. This number would reflect a substantial turnover among a considerably larger number of individuals.

Annual figures for Nome census division employment and population in the years 1981 to 2000 are provided in Table IV.B.3.b.-2, together with annual ratios of employment to population. In the absence of OCS development, the employment/population ratio would remain virtually constant at about 0.32 throughout the 20-year period. Comparable historical figures were presented in Table III.D.2.f.-2 showing annual employment/population ratios ranging from a low of 0.20 in 1963 to a high of 0.33 in 1978 and 1979. As a further basis for comparison, in 1978 total wage and salary employment in the United States averaged 93,088,000 jobs; and the U.S. population was estimated at 218,050,800 for an employment/population ratio of 0.43.

Assuming OCS development at expected levels, the employment/population ratio for the Nome census division would rise from 0.32 in 1981 to 0.37 in 1988, declining thereafter to 0.34 in 1990 and remaining at 0.34 through the year 2000 (see Table IV.B.3.b.-2, column 8). These indications of OCS employment impact are based on employment figures which do not include nonresident OCS commuters.

Within the city of Nome and immediate area, annual employment/population ratios are higher than for the entire Nome census division due to the relatively small number of jobs in the outlying communities. Employment and population figures for the city of Nome and immediate area are provided in Tables IV.B.3.b.-3 and IV.B.3.b.-4, but none of these figures were based on the same definitions and assumptions as the Nome census division figures in Table IV.B.3.b.-2.

Nonetheless, to provide some measure of comparison, annual projections of employment/population ratios are presented in Table IV.B.3.b.-4 for the city of Nome and the immediate area. A comparison of the ratios in columns 3 and 8 shows that in most years OCS development would increase the employment/population ratio for the city of Nome and immediate area. However, in the years 1987 to 1990, OCS development would slightly decrease the employment/population ratio. This would occur because the projected employment gain would be more than offset by the projected increase in population caused by OCS activities. (Please note that the ratios in columns 3 and 8 exclude commuters.)

Table IV.B.3.b.-2

Nome Census Division[1/]
Resident Population and Resident Employment[2/]
With and Without OCS Development
Mean Case

	Without OCS Development			Impacts of OCS Development (Mean Case)		Population and Employment Projections With OCS Development		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	Population	Wage & Salary Employment (Incl. Military)	Ratio: Employment/ Population	Population	Wage & Salary Employment	Population	Wage & Salary Employment (Incl. Military)	Ratio: Employment/ Population
1981	7,035	2,271	0.32	0	0	7,035	2,271	0.32
1982	7,208	2,338	0.32	0	0	7,208	2,338	0.32
1983	7,329	2,380	0.32	228	255	7,557	2,635	0.35
1984	7,423	2,410	0.32	443	330	7,866	2,740	0.35
1985	7,502	2,434	0.32	1,105	639	8,607	3,073	0.36
1986	7,574	2,455	0.32	1,617	793	9,191	3,248	0.35
1987	7,643	2,474	0.32	2,387	1,127	10,030	3,601	0.36
1988	7,712	2,493	0.32	3,169	1,481	10,881	3,974	0.37
1989	7,783	2,511	0.32	2,755	1,215	10,538	3,726	0.35
1990	7,856	2,530	0.32	1,676	752	9,532	3,282	0.34
1991	7,933	2,550	0.32	998	503	8,931	3,053	0.34
1992	8,014	2,570	0.32	693	400	8,707	2,970	0.34
1993	8,099	2,591	0.32	571	360	8,670	2,951	0.34
1994	8,189	2,613	0.32	533	349	8,722	2,962	0.34
1995	8,283	2,637	0.32	510	344	8,793	2,981	0.34
1996	8,383	2,661	0.32	484	337	8,867	2,998	0.34
1997	8,487	2,687	0.32	432	334	8,919	3,021	0.34
1998	8,596	2,713	0.32	429	334	9,025	3,047	0.34
1999	8,710	2,741	0.31	431	337	9,141	3,078	0.34
2000	8,829	2,770	0.31	428	336	9,257	3,106	0.34

1/ Includes 16 smaller communities in addition to the city of Nome. The small communities are scattered over the Seward Peninsula, Little Diomede and St. Lawrence Islands.

2/ Non-resident OCS workers who reside outside the Nome area during periods of rest and recreation (commuters) are excluded from the population and employment figures presented above. See Table IV.B.3.b.-1, ,Footnote 1, for an explanation of these excluded OCS workers. However, it should be noted that a small number of non-OCS workers, principally in gold mining and construction, also leave the Nome area for a part of each year, but are included in the employment and population figures shown above.

Source: All population and employment projections are those generated by the SCIMP model and presented in Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models (Nov. 3, 1980), or are derived from the SCIMP model projections by addition or substraction.

Table IV.B.3.b.-3

CITY OF NOME & IMMEDIATE AREA
POPULATION AND EMPLOYMENT
NON-OCS BASE CASE

Year	(1) Population	(2) Full-time Equivalent Wage & Salary Employment (Civilian Only)	(3) Ratio: Col (2)/Col (1)	(4) Modified Wage & Salary Employment (Incl Military)	(5) Ratio: Col (4)/Col (1)
1979	3,064	1,071	0.35	1,423	0.46
1980	3,125	1,094	0.35	1,454	0.47
1981	3,188	1,116	0.35	1,483	0.47
1982	3,252	1,171	0.36	1,556	0.48
1983	3,317	1,194	0.36	1,586	0.48
1984	3,383	1,218	0.36	1,618	0.48
1985	3,451	1,277	0.37	1,697	0.49
1986	3,520	1,302	0.37	1,730	0.49
1987	3,590	1,328	0.37	1,764	0.49
1988	3,662	1,392	0.38	1,850	0.51
1989	3,735	1,419	0.38	1,885	0.50
1990	3,810	1,448	0.38	1,924	0.50
1991	3,829	1,493	0.39	1,984	0.52
1992	3,848	1,501	0.39	1,994	0.52
1993	3,867	1,508	0.39	2,004	0.52
1994	3,886	1,477	0.38	1,962	0.50
1995	3,905	1,484	0.38	1,972	0.50
1996	3,925	1,492	0.38	1,982	0.50
1997	3,945	1,499	0.38	1,992	0.50
1998	3,965	1,507	0.38	2,002	0.50
1999	3,985	1,514	0.38	2,012	0.50
2000	4,005	1,522	0.38	2,022	0.50

Sources: Population and employment figures in columns 1 and 2 are those presented in OCS Technical Report No. 53 (p. 179). Employment figures in column 4 have been modified to correspond to the definitions and procedures used by the Alaska Department of Labor in reporting civilian wage and salary employment. Figures in column 4 also include a small number of military personnel. As a result of these modifications, figures in column 4 are roughly comparable to the figures presented in Table IV.B.3.b.-2 for the Nome census division. The figures in column 4 differ from those in column 2 by including part-time as well as full-time positions, with no adjustment to a full-time equivalent basis. The figures in column 4 also include a small number of military personnel. In addition, the column 4 figures are annual averages, while figures in column 2 are for the month of November.

Preparation of employment figures in column 4 was as follows:

(1) Annual average wage and salary employment (civilian) for the Nome census division in 1979 was reported as 2208 in the Statistical Quarterly published by the Alaska Department of Labor. To obtain a figure for civilian wage and salary employment (annual average) in the city of Nome and immediate area, a factor of 0.64 was applied to the census division total. The 0.64 factor was taken from OCS Technical Report No. 53 (p. 45).

(2) An estimate of ten military personnel was added to the 1979 estimate of civilian annual average wage and salary employment, as determined in Step (1) above.

(3) For years subsequent to 1979, employment figures in column 4 are changed by the same proportions as figures in column 2.

Table IV.B.3.b-4
City of Nome and Immediate Area[1/]
Resident Population and Resident Employment[2/]
With and Without OCS Development
Mean Case

	Without OCS Development			Impacts of OCS Development (Mean Case)		Population and Employment Projections With OCS Development		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	Population	Wage & Salary Employment (Incl. Military)	Ratio: Employment/ Population	Population	Wage & Salary Employment	Population	Wage & Salary Employment (Incl. Military)	Ratio: Employment/ Population
1981	3,188	1,483	0.47	0	0	3,188	1,483	0.47
1982	3,252	1,556	0.48	0	0	3,252	1,556	0.48
1983	3,317	1,586	0.48	228	255	3,545	1,841	0.52
1984	3,383	1,618	0.48	443	330	3,826	1,948	0.51
1985	3,451	1,697	0.49	1,105	639	4,556	2,336	0.51
1986	3,520	1,730	0.49	1,617	793	5,137	2,523	0.49
1987	3,590	1,764	0.49	2,387	1,127	5,977	2,891	0.48
1988	3,662	1,850	0.51	3,169	1,481	6,831	3,331	0.49
1989	3,735	1,885	0.50	2,755	1,215	6,490	3,100	0.48
1990	3,810	1,924	0.50	1,676	752	5,486	2,676	0.49
1991	3,829	1,984	0.52	998	503	4,827	2,487	0.52
1992	3,848	1,994	0.52	693	400	4,541	2,394	0.53
1993	3,867	2,004	0.52	571	360	4,438	2,364	0.53
1994	3,886	1,962	0.50	533	349	4,419	2,311	0.52
1995	3,905	1,972	0.50	510	344	4,415	2,316	0.52
1996	3,925	1,982	0.50	484	337	4,409	2,319	0.53
1997	3,945	1,992	0.50	432	334	4,377	2,326	0.53
1998	3,965	2,002	0.50	429	334	4,394	2,336	0.53
1999	3,985	2,012	0.50	431	337	4,416	2,349	0.53
2000	4,005	2,002	0.50	428	336	4,433	2,338	0.53

1/ The figures in this table represent population and employment within the 1980 boundaries of the city of Nome and within these four nearby areas: (1) Nome-Beltz, (2) FAA, (3) Icy View, and (4) Alaska Gold.

2/ Non-resident OCS workers who reside outside the Nome area during rest periods (commuters) are excluded from the population and employment figures presented above.

Source: Population figures in column 1, showing the population expected in the absence of OCS activity, are those presented in OCS Technical Report No. 53 (p. 179). Employment figures in column 2, indicating expected numbers of jobs in the absence of OCS activity, are modifications of the employment projections in OCS Technical Report No. 53 (p. 179). (See the source notes on Table IV.B.3.b.-3 for a detailed explanation of the nature of the modifications.) The modifications were necessary to provide employment figures for the city of Nome which are comparable to figures presented elsewhere for the Nome census division. In addition, the modifications reflected in column 2 were necessary to provide comparability to the OCS impact employment figures in column 5 above. OCS impact figures for population and employment, in columns 4 and 5, are those generated by the SCIMP Model and reported in Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models, Nov. 3, 1980 (p. 486).

The total population increase caused by OCS development would include not only successful OCS in-migrant job seekers, but also the dependents of successful in-migrant job seekers. In addition, the total population increase would include a number of unsuccessful job seekers. Therefore, if commuters are excluded from consideration, it is not unreasonable that in some years the net effect of OCS development might be to lower the employment/population ratio for the city of Nome and the immediate area.

The comparison of employment/population ratios in columns 3 and 8 of Table IV.B.3.b.-4 is based on employment and population figures that include OCS in-migrants (i.e., newcomers), as well as long term residents of the Nome area. Therefore, those figures tell nothing about the economic impact of OCS development on persons who would have been in the Nome area in the absence of OCS development.

Table IV.B.3.b.-5 does provide employment/population ratios based on projected figures for employment and population which exclude OCS in-migrant workers and the associated in-migrant population. Figures are shown for the Nome census division and for the city of Nome and immediate area. Although it must be pointed out again that the employment and population projections for the city of Nome and immediate area are not entirely comparable to those figures for the Nome census division, both sets of figures clearly indicate that OCS development is expected to provide increased employment possibilities for the more long-term residents.

As discussed earlier, the employment/population ratio for the Nome census division would remain virtually constant at about 0.32 throughout the years 1981-2000 in the absence of OCS development (see colum 1 of Table IV.B.3.b.-5). With OCS development, employment among persons who would have been in the Nome area in the absence of OCS development would increase to a ratio of 0.37 of the population in 1984 and decline very gradually thereafter. However, it would at all times be about 0.04 higher than in the absence of OCS development (see column 2). In the year 2000, for example, the ratio would be 0.35 with OCS activity compared to only 0.31 without OCS activity. Even larger proportional gains occur in the immediate Nome area (see columns 3 and 4).

Summary: The pattern of expected OCS development will be a boom-bust cycle, judged by the total employment impact, including jobs held by commuters (workers who leave the Nome area during periods of rest and recreation).

However, it is assumed that the negative effects of the boom-bust pattern will be greatly moderated by the use of large numbers of commuter workers who would be housed in dormitories offshore or at an enclave some miles distant from the present limits of the city of Nome and who would fly out of the Nome area during periods of rest and recreation.

Nonetheless, one very likely result of the boom-bust cycle is an increased rate of price inflation in the city of Nome during the years 1983-1988 when the employment impact is building towards its peak. Most of the price inflation effects are likely to involve prices charged by hotels, restaurants, and bars. In addition, housing costs could rise sharply and a serious housing shortage could develop if appropriate planning is not undertaken by local and state government, local businesses, and the oil industry. If OCS activities should pre-empt transporation facilities needed to bring consumer goods into the area,

Table IV.B.3.b-5
OCS Impact on Job Opportunities for Persons Who Would Have Been in the Nome Area in the Absence of OCS Development (Projected Ratios of Wage & Salary Employment to Population, Excluding OCS In-Migration Population and Job Holders)

	(1) Nome Census Division[1/]	(2)		(3) City of Nome & Immediate Area[2/]	(4)
Year	Without OCS Development	With OCS Development	Year	Without OCS Development	With OCS Development
1981	0.32	0.32	1981	0.47	0.47
1982	0.32	0.32	1982	0.48	0.48
1983	0.32	0.36	1983	0.48	0.56
1984	0.32	0.37	1984	0.48	0.57
1985	0.32	0.37	1985	0.49	0.59
1986	0.32	0.37	1986	0.49	0.59
1987	0.32	0.37	1987	0.49	0.58
1988	0.32	0.37	1988	0.51	0.61
1989	0.32	0.37	1989	0.50	0.61
1990	0.32	0.36	1990	0.50	0.59
1991	0.32	0.36	1991	0.52	0.60
1992	0.32	0.36	1992	0.52	0.60
1993	0.32	0.36	1993	0.52	0.60
1994	0.32	0.36	1994	0.50	0.59
1995	0.32	0.36	1995	0.50	0.59
1996	0.32	0.36	1996	0.50	0.59
1997	0.32	0.36	1997	0.50	0.59
1998	0.32	0.35	1998	0.50	0.59
1999	0.31	0.35	1999	0.50	0.59
2000	0.31	0.35	2000	0.50	0.59

1/ The Nome census division includes 16 smaller communities in addition to the city of Nome.

2/ Figures for the city of Nome reflect population and employment within the 1980 boundaries of the city of Nome and within these four nearby areas: (1) Nome-Beltz, (2) FAA, (3) Icy View, and (4) Alaska Gold

Sources: Ratios in columns 1 and 2 are based on figures published in Bering-Norton Base Case and Impact Results from the MAP and SCIMP Model, Nov. 3, 1980 (pp. 456, 487). Figures in column 3 above are the same as those in column 5 of Table IV.B.3.b.-3. (A detailed explanation of sources and procedures used in computing these ratios is provided in the source notes to TableIV.B.3.b.-3.) Ratios in column 4 above are modifications of those in column 3 based on OCS impact employment figures in Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models, Nov. 3, 1980 (p. 487).

serious problems could develop. However, if plans for the improvement of the port of Nome remain on schedule, transportation facilities should be adequate for the increased levels of activities accompanying sale 57.

Minor adverse impacts on the commercial and subsistence use of fisheries resources by residents of the Nome census division is very likely to occur as a result of sale 57 activities. Section IV.B.2.b. provides a detailed discussion of possible impacts on fisheries resources. Minor adverse impacts on bird and marine mammal resources used for subsistence are also likely over the life of the oil field, but the overall probability of significant long-term adverse impacts on these resources is believed to be unlikely. Sections IV.B.2.c. and IV.B.2.d. discuss impacts on birds and marine mammals.

Other possible economic problems appear to be relatively slight. Based on the assumptions used in preparing the employment projections in Table IV.B.3.b.-1, it does not appear that new in-migrants to the area would take jobs away from long term residents. To the contrary, it would appear that job opportunities created by OCS development would boost employment among permanent Nome area residents, and that this increase in job-holding by permanent area residents would be maintained for a period of more than 15 years.

These optimistic projections of increased job-holding by the more permanent residents of the Nome area are based on a number of assumptions, some of which may prove to be in error. Matters of policy which are impossible to predict would play a role. Included are policy decisions by oil companies and their contractors and policy decisions made by the state and federal governments. A strong Alaska hire policy by the state government and strong equal employment opportunity and affirmative action policies by the federal government would be positive factors.

Conclusion: Although total employment in activities directly related to petroleum development will probably peak at an estimated 3,200 jobs, a number of these activities will be in excess of the total employment in the Nome census division at the present time. A serious housing shortage is believed likely to develop, accompanied by increased housing costs. Wildlife resources which are the basis for important commercial and subsistence economic activities are expected to suffer only minor damage during the life of the field. Benefits of the sale to the local economy include a moderate increase in jobholding by long-term residents of the area and a possible decrease in energy costs if the sale results in the local production and distribution of natural gas and heating oil.

Effect of Additional Mitigating Measures: Most of the suggested mitigating measures in Section II.B.1.c. address protection of the natural environment. These measures, which could reduce possible damage to the commercial fisheries resources and the subsistence hunting and fishing resources of the area, are evaluated in Section IV.B.2.b. and IV.B.1.c.

None of the suggested mitigating measures are addressed toward possible impacts on rates of price inflation. However, with respect to inflation of rental rates for residential housing and access to housing, Alaska Statute, Chapter 06, Emergency Residential Rent Regulation and Control, provides a potential protection to residents of the Nome area. This statute establishes authority for the Governor of Alaska to issue a proclamation of housing

emergency for any part of the state. During a housing emergency, no landlord within the geographic area covered by the proclamation may raise housing rents or evict a tenant in violation of regulations established by the Commissioner of the Alaska Department of Commerce under provisions of AS 34.06.

Although the use of large numbers of commuters (OCS workers who would live in company dormitories offshore or in an enclave and who would fly out of the Nome area during rest periods) is not technically a mitigating measure for this proposal, it is an extremely important assumption of the economic analysis presented in this EIS. Therefore, in interpreting this analysis, the reader should treat this assumption as a mitigating factor. The mitigating effectiveness of the assumed use of large numbers of commuters would be very great with respect to reducing inflationary impacts and the severity of housing shortages and the housing problems for local residents. However, even with the use of large numbers of commuters, these negative economic impacts could be severe.

Cumulative Effects: It is useful to note four other economic developments which may coincide with OCS petroleum development:

(1) Construction of a much-improved port facility at Nome is currently expected by the end of 1983. This development is considered a virtual certainty and is reflected in the employment and population projections presented earlier for both the non-OCS and the OCS development scenarios.

(2) Development of a fluorite-tin-tungsten deposit on the Seward Peninsula, which would result in construction of a deepwater port in the Lost River area northwest of Nome, is a distinct possibility before the year 2000. However, the timing of this project is extremely difficult to predict; and no employment or population impacts of this development are included in the non-OCS projections presented above.

(3) Onshore petroleum development of land controlled by the Calista Corporation could occur. Preliminary (non-drilling) exploration is already underway under contract to AMOCO Production Company, but there is no certainty that exploratory drilling will take place and even less certainty that oil in commercial quantities will be discovered and developed.

(4) Petroleum development in State of Alaska submerged lands in the nearshore area (0-3 miles) is a possibility as a result of a planned lease offering early in 1983. However, the exact areas to be leased are still undetermined, and no basis for estimating the possible economic impacts presently exists.

The only observation that can be made at this time about the hard minerals and onshore or nearshore petroleum developments listed above is that they could, either individually or collectively, have substantial economic impact on the Nome census division which coincide with the impacts of planned OCS activities. These possible additional developments would supplement both the positive effects, principally jobs, and the negative impacts, principally price inflation and a possible housing shortage, expected from OCS activities. These developments might also, in common with OCS sale 57, have undesirable impacts on commercial fishing and on subsistence hunting, fishing, whaling, and gathering activities on which Eskimo residents of the area rely for a major part of their food.

Unavoidable Adverse Effects: One almost certain adverse result of OCS development would be an increased rate of inflation during the years 1983-1988. The cost of living in the Nome area has been recently estimated at 225 percent of average U.S. living costs (Alaska Department of Commerce and Economic Development, 1979), and this already serious problem could be made worse by OCS development. The large size of projected OCS employment and population impacts, combined with the limited number of trade and service establishments in Nome, offer conditions conducive to increased rates of inflation. However, most of the price inflation expected to occur in Nome will be in prices charged by hotels, restaurants, and bars. Price increases of this type will not impose severe hardships on most local residents.

The greatest potential impact to current residents of the city of Nome is in the area of housing costs. If proper steps are not planned and carried out to prevent a severe housing shortage, current Nome residents who rent their housing could be forced to move to some other community. The oil pipeline construction boom forced some long term residents of Fairbanks to leave that community due to drastic increases in rent; similar effects are possible in Nome.

C. Alternative II - No Sale

With this alternative, there would be no federal leasing at this time in Norton Sound. In the absence of a sale, the impacts, cumulative effects, and unavoidable adverse effects associated with the proposed lease sale will be eliminated. The effect of mitigating measures would not be applicable.

1. Impacts on Social Systems:

a. Impacts on Population: There would be no adverse impacts or unavoidable adverse effects on Nome and the surrounding villages as a result of this alternative. Refer to Section IV.B.1.a. for a discussion of cumulative effects which may result from other sources.

b. Impacts on Sociocultural Systems: There would be no adverse impacts or unavoidable adverse effects on Nome and the surrounding villages as a result of this alternative. Refer to Section IV.B.1.b. for a discussion of cumulative effects which may result from other sources.

c. Impacts on Subsistence Patterns: There would be no adverse impacts or unavoidable adverse effects on Nome and the surrounding villages as a result of this alternative. Refer to Section IV.B.1.c. for a discussion of cumulative effects which may result from other sources.

d. Impacts on Village Livelihood: There would be no adverse impacts or unavoidable adverse effects on Nome and the surrounding villages as a result of this alternative. Refer to Section IV.B.1.d. for a discussion of cumulative effects which may result from other sources.

e. Impacts on Urban Infrastructure - Nome Base Case (Non-OCS): There would be no adverse impacts or unavoidable adverse effects on Nome and the surrounding villages as a result of this alternative. Refer to Section IV.B.1.e. for a discussion of cumulative effects which may result from other sources. It should be noted that change will be occurring within the Nome

infrastructure without OCS actions. Information is provided in Policy Analysts, Limited (1980), Technical Report No. 53. Table IV.B.3.b.-3 outlines the population and employment projected for Nome between 1982-2000. The Nome projection expects the greatest gains in population and employment to occur in the 1980's and 1990's.

Nome is forecast to experience moderate growth during this period. Plans are in place or under consideration for the upgrading of most of the services and utilities. If implemented, they should accommodate the expected growth.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat: There would be no adverse impacts or unavoidable adverse effects on Yukon River delta habitats as a result of this alternative. Refer to Section IV.B.2.a. for a discussion of cumulative effects which may result from other sources.

b. Impacts on Fish Resources: There would be no adverse impacts or unavoidable adverse effects on fish or fish resources of Norton Sound as result of this alternative. Refer to Section IV.B.2.b. for a discussion of cumulative effects which may result from other sources.

c. Impacts on Birds: There would be no adverse impacts or unavoidable adverse effects on avian species as a result of this alternative. Refer to Section IV.B.2.c. for a discussion of cumulative effects which may result from other sources.

d. Impacts on Marine Mammals: There would be no adverse impacts or unavoidable adverse effects on marine mammals as a result of this alternative. Refer to Section IV.B.2.d. for a discussion of cumulative effects which may result from other sources.

e. Impacts on Endangered Species: There would be no adverse impacts or unavoidable adverse effects on endangered species as a result of this alternative. Refer to Section IV.B.2.e. for a discussion of cumulative effects which may result from other sources.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: Because the proposed sale would have only mild economic effects in parts of Alaska other than the Nome census division, omitting the sale would have only minor effects outside the Nome census division. These effects are not discussed in the text of this document. Statewide population and employment projections for the years 1980 to 2000, both with and without the sale, are presented in "Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models" (November 3, 1980). Similar projections are provided for the Anchorage region, which serves as the transportation and trade center for most of the state, including the Nome area.

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): If the sale is not held, none of the economic impacts described in Section IV.B.3.b. will occur.

D. Alternative III - Delay the Sale

With this alternative, the proposed lease sale would be delayed in time for a period of 3 years. (See Sec. II.B.2.a.) The following sections assess the effects of such a delay.

1. Impacts on Social Systems:

a. Impacts on Population: See the discussion under the proposal, Section IV.B.1.a. Population impacts would be the same, only delayed.

Conclusion: Population impacts, which are significant, would be delayed.

Effect of Additional Mitigating Measures: The effect of mitigating measures would be the same as described for the proposal in Sections IV.B.1.c. and e., on subsistence and infrastructure.

Cumulative Effects: Refer to the discussion in Section IV.B.1.a.

Unavoidable Adverse Effects: See the discussion in Section IV.B.1.a.

b. Impacts on Sociocultural Systems: Delaying the sale would provide more time for adjustments and planning. It would delay the returns on sociocultural investments of time and goods in cultural processes but would also delay local and regional negative impacts on culture.

Conclusion: Delaying the sale would delay the impact. The delay itself would not reduce the impact.

Effect of Additional Mitigating Measures: If the suggested Orientation Program measure contained discussions of the present people, their institutions, the functions of those institutions and groups, and the effects that contacts by OCS-related employees in the villages could have, then (with increased understanding), the orientation program could lessen the impacts. It could not, however, totally mitigate them. (See Sec. II.B.1.c.)

Cumulative Effects: Delaying the sale would delay cumulative impacts on sociocultural resources.

Unavoidable Adverse Effects: Delaying the sale would delay unavoidable adverse effects on sociocultural resources.

c. Impacts on Subsistence Patterns: The impacts which would occur to subsistence use would be the same as for the proposal, except that they would be delayed. A delay would provide additional time to prepare and plan for oilspill contingencies, local response organizations, and to negotiate with industry on enclave measures to minimize impacts on subsistence use and users. Additional time for documentation of baseline subsistence use and harvests would also be facilitated. It would also provide additional time for organization and implementation of Coastal Resource Area plans, presently under way in Norton Sound, Nome, and the Yukon Delta areas. (Refer to Section IV.H.4., Impacts on Coastal Zone Management.) These would be the primary benefits of a delay in the proposed sale.

Conclusion: Impacts on subsistence would be the same as for the proposal, only delayed. Impacts on subsistence would be the same as for the proposal, only delayed. A delay would provide time for CZM planning, subsistence baseline information gathering, and organization of community response to OCS related issues. See Section IV.B.1.c. for the assessment expected with the proposal.

Affect of Additional Mitigating Measures: The effects of mitigating measures would be the same as described for the proposal in Section IV.B.1.c.

Cumulative Effects: See the discussion in Section IV.B.1.c.

Unavoidable Adverse Effects: Refer to the discussion in Section IV.B.1.c.

d. Impacts on Village Livelihood: Refer to the discussion under the proposal (Sec. IV.B.1.d.). The impacts on village livelihood would be the same, only delayed. Baseline conditions in the area of call appear to be changing, however, particularly with regard to federal budget cuts which affect income assistance programs, health care assistance, CETA programs, and related federal social and health service budgets. These FY 1982 budget cuts appear now to be causing a cash "squeeze" for many families in the Norton Sound-Yukon Delta areas where few opportunities for cash-producing work exist (Tundra Times, Oct.-Nov. issues, 1981). If these baseline conditions continue without amelioration by state or federal assistance, already low standards of living in the lease area could actually deteriorate further before a delayed lease sale. If this occurred, the added stress of this deteriorating cash position in the villages could alter, to an unknown extent, local attitudes and opinions about OCS.

Conclusion: Effects on village livelihood would be the same as for the proposal, only delayed.

Effect of Additional Mitigating Measures: The effect of mitigating measures on villages would be the same as for the subsistence discussion (Sec. IV.B.1.c.).

Cumulative Effects: See the discussion in Section IV.B.1.a.

Unavoidable Adverse Effects: These would be the same as for the proposal, only delayed.

e. Impacts on Urban Infrastructure: Delaying the proposed sale 3 years would delay the impacts cited in Alternative I (Sec. IV.B.1.e.) for a period of 3 years. This 3-year delay would provide additional time for Nome to plan and prepare for the community infrastructure impacts described in Alternative I. Such a delay might also cause further inflation of housing and residential land costs by increased speculation.

Conclusion: Extreme housing shortages and major problems associated with providing water and sewage facilities for the housing units would remain the anticipated short-term impacts. The 3-year delay, however, would provide time to plan for these onshore impacts to mitigate problems associated with short-term shortages in housing stocks (approximately 1,000 units by 1988) followed by a long-term surplus (over 800 units in 2000).

Effect of Additional Mitigating Measures: The effect of mitigating measures remains as described in Section IV.B.1.e.

Cumulative Effects: Cumulative effects remain the same as those described in Section IV.B.1.e.

Unavoidable Adverse Effects: Unavoidable adverse effects remain as described in Section IV.B.1.e.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat:

This alternative simply delays the possible impacts. It neither changes the assessment nor resolves the impacts. Therefore, the potential impacts on the Delta are similar to those for the proposal (Sec. IV.B.2.a.).

Conclusion: Should a large oilspill contact the Delta simultaneously with a storm-surge event, oil could be driven inland onto higher marsh surfaces where it could persist for 5 to 10 years with resultant long-term (chronic) effects on the biota (principally waterfowl and fish) of these marsh habitats. The effects would more likely be local and are not anticipated to result in regional impacts. The intensity of these effects would depend on the size and location of the affected area. The likelihood of such an event is considered very low because of the unusual set of circumstances that would have to occur simultaneously by chance.

Effect of Additional Mitigating Measures: If the federal sale is delayed and state and private sales proceed, some of the mitigating measures (or industry operating regulations) may be initiated by the latter parties. This means that the intent and effectiveness of the mitigating measures, as described in Section IV.B.2.a., may change.

Cumulative Effects: If the federal offshore oil and gas lease sale is delayed, the biological resources of the Yukon River Delta may still be affected by the State of Alaska Norton Basin proposed lease sale within 3 miles of the Delta and by any Calista Corporation oil and gas leasing on the Delta.

Unavoidable Adverse Effects: If there is no federal sale, there would be no long-term unavoidable effects on the Delta due to federal actions.

b. Impacts on Fish Resources: Delaying the sale would postpone the impacts identified and discussed in Section IV.B.2.b. It is possible that a delay would provide sufficient time to conduct studies to fill "data gaps" and provide for a more complete analysis of impacts. One such information need is a study of the salmon smolt distribution off the major spawning rivers of the region. Even if these studies were conducted, however, it is not likely that they would change the conclusions provided in Section IV.B.2.b.

A delay may also provide time for increased technology for oilspill containment and cleanup, which may further reduce the probability of adverse impacts.

Conclusion: Impacts on fish resources and commercial fishing activities for this alternative would be the same as the proposal (see Sec. IV.B.2.b.).

Effect of Additional Mitigating Measures: Effects of mitigating measures would be the same as those discussed under the proposal (refer to Sec. IV.B.2.b.).

Cumulative Effects: Cumulative effects and related mitigating measures may be better assessed if the sale were delayed. Discoveries elsewhere in Alaska or off its coast could alter impact analysis related to this proposed lease sale. Refer to Section IV.B.2.b. for a discussion of cumulative effects.

Unavoidable Adverse Effects: Unavoidable adverse impacts would be the same as those of the proposal (Refer to Sec. IV.B.2.b.).

c. Impacts on Birds: Under this alternative, projected impacts would be the same as those previously described under the proposal (Alternative I). This alternative would only postpone the time of potential impact on birds to some future time frame.

Conclusion: Under this alternative, the same impacts as described under the proposal would occur, but later in time.

Effect of Additional Mitigating Measures: Refer to the discussion under the proposal (Sec. IV.B.2.c.).

Cumulative Effects: The additive effect of the proposal and other activities in the proposed lease area would be the same under this delay-of-sale alternative.

Unavoidable Adverse Effects: The unavoidable adverse effects on birds under this delay-of-sale alternative would be the same as those described under the proposal but would occur at some later time.

d. Impacts on Marine Mammals: Effects associated with this alternative would be essentially the same, at least qualitatively, as those discussed for the proposal (Sec IV.B.2.d.). The magnitude of effects could vary, depending on population status of affected species at the time the delay would terminate or when the undesirable effects would occur. Delay of sale would provide additional time for ongoing research to acquire data useful in improving the accuracy and precision of impact prediction relative to marine mammals.

e. Impacts on Endangered Species: Effects associated with this alternative would be essentially the same, at least qualitatively, as those discussed for the proposal (Sec. IV.B.2.e.). The magnitude of effects could vary, depending on population status of affected species at the time the delay would terminate or when undesirable effects would occur. Delay of sale would provide additional time for ongoing research to acquire additional data useful in improving the accuracy and precision of impact prediction.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: The proposed sale would have only mild economic effects in parts of Alaska other than the Nome census division. Consequently, delay of the sale would have no important effects outside the Nome area.

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): Delaying the sale would merely delay the results cited in Section IV.B.3.b. (see Table IV.B.3.b.-1).

Conclusion: Delaying the sale would merely delay those developments cited in Section IV.B.3.b.

Effect of Additional Mitigating Measures: Refer to Section IV.B.3.b.

Cumulative Effects: Refer to Section IV.B.3.b.

Unavoidable Adverse Effects: Refer to Section IV.B.3.b.

E. Alternative IV - Northern Deletion (308 Blocks)

This alternative suggests the deletion of 121 blocks in the northern portion of the proposed sale area (see Fig. II.B.4.a.-1) The following sections assess the impacts of oil and gas leasing for Alternative IV.

1. Impacts on Social Systems:

a. Impacts on Population: Refer to the discussion of this alternative in Section IV.B.1.c. (subsistence impacts). From the standpoint of onshore impacts projected, this alternative is not significantly different from the proposal. Peak population impacts of close to 1,200 OCS residents, not part of the additional 1,500-plus enclave-worker population, would be added to the Nome area during the 1986-1991 peak period. This is a significant impact. From 1985, when 536 non-enclave OCS residents are added to the Nome area population, to 1994 when the non-enclave OCS population finally drops to 559, Nome would experience boom-town population conditions, including severe housing problems, severe inflation, high sociocultural stress levels, increased violent crime, and other known characteristics of boom-towns. See the discussions in the sections on Economy (IV.B.3.), infrastructure (IV.B.1.e.), subsistence (IV.B.1.c.), and sociocultural systems (IV.B.1.b.) for assessments of these impacts.

Conclusion: The social impacts associated with onshore development during the peak growth period of 1986-1991 would be significant. For the period 1985-1994, OCS resident population outside of a presumed enclave commuter group at Cape Nome would severely strain the local Nome economy, infrastructure, social system, and local culture and lifestyles. Under this alternative, boom-town conditions, which have been documented for Fairbanks and Valdez during peak pipeline impact, could be anticipated to occur here. The size of the onshore population impacts under this alternative would be somewhat moderated over those of the proposal but would not be significantly different in kind. See the discussion under the proposal in Section IV.B.1.a.

Effect of Additional Mitigating Measures: Refer to the discussion under the proposal, Sections IV.B.1.c. and e., subsistence and infrastructure.

Cumulative Effects: See the discussion under the proposal, Section IV.B.1.c. and e., subsistence and infrastructure, and Section IV.B.1.a., population. Increased population impacts from the Nome port project and the Lost River

Mining project would add to Nome's population. To a lesser extent, State of Alaska sale 38 could also affect Norton Sound's population.

Unavoidable Adverse Effects: See the discussion under the proposal. An additional 1,200 new residents would significantly change the composition of Nome's population; its ethnic character; and its the predominant culture, social, and political climate. This would be a significant impact and would be unavoidable unless an enclave were expanded to include these presumed new Nome residents.

b. Impacts on Sociocultural Systems: Deletion of the northern blocks would lower the sociocultural impacts discussed in the proposal moderately because of the deletion of blocks close to Nome. This deletion, however, does not affect the location of an enclave or the interaction of exploration populations with Nome if there is no enclave.

Conclusion: It is expected that this deletion would have only slightly less long-term local and regional impact on sociocultural resources than the proposal.

Effect of Additional Mitigating Measures: If the suggested Orientation Program contained discussions of the present people, their institutions, the function of those institutions and groups, and the effects that contacts by OCS-related employees in the villages could have, then (with increased understanding) the orientation program could lessen the impacts. It could not, however, totally mitigate them.

Cumulative Effects: The proposed State sale; the Calista Corporation oil and gas leasing; possible tanker traffic from proposed sales 83, 85, and 86; port development in Nome; and hard minerals exploration are possible projects occurring during exploration and development under this alternative. The proposed Chukchi and new Beaufort Sea sales may be in the exploration or development phase during this proposed Norton Sound sale. This alternative reduces the impacts of these projects only slightly for the reasons mentioned in the above paragraph.

Unavoidable Adverse Effects: This alternative produces unavoidable adverse effects similar to the proposal. They are lowered only slightly by this deletion alternative.

c. Impacts on Subsistence Patterns:

Oilspill Risk: According to the Oilspill Risk Analysis (OSRA) Summary, Appendix J, the northern deletion reduces the risks to land by approximately 40 percent over that of the proposal. From the analysis of the overall probabilities for a 10-day risk period for the six targets discussed in Section IV.B.1.c., the northern deletion alternative reduces the risk of a small oilspill on the gray whale feeding area from 75-percent for the proposal to 51-percent. The risk of a large oilspill is reduced from 47-percent to 29-percent. The second target, mid-boundary target No. 5, winter season, shows a reduction from 53 percent to 30-percent for small oilspills and from 28-percent to 14-percent for larger oilspills. For the king crab target, the risk of a small oilspill is reduced from 43-percent to 24-percent. The risk of a larger oilspill is reduced from 20-percent to 10-percent. Reductions in the

other three targets reduce these targets to moderate or low risk (less than 20 percent).

From this comparison of oilspill risk, it is clear that the Chirikof Basin targets still are at high (over 20-percent) risk of oilspill contact in 10 days under this alternative, as is the Nome area king crab target. The mid-boundary No. 1 target (summer season) and mid-boundary No. 4 target (winter season) are, under this alternative, in moderate (10- to 19-percent) risk of smaller oilspills within a 10-day period. The probability of larger oilspills for the seabird foraging target No. 2, winter season, and for two of the king crab targets is reduced to low risk. The king crab mid-boundary No. 1, summer, and mid-boundary No. 4, winter.

From a village perspective, risks are still highest to Savoonga and, to a lesser extent, other Bering Strait villages dependent upon walrus, whales, and seals. Nome-area villages and commercial fishing villages dependent upon the crab harvest would still be at risk should an oilspill reduce or temporarily displace resources of the immediate subsistence-use area.

Onshore Impacts: The population demands of this alternative vary from the mean onshore case by year but range from about 70-percent in most other years, averaging about 88-percent over the life of the field. Again, it is difficult to assess the incremental difference to be expected with this alternative, as compared with the proposal. Under full development of the proposal and this alternative, impacts would be significant and particularly intense during the peak 1986 to 1991 period. Magnitudes would be moderated somewhat by this alternative with 4 years of close to 1,000 population at peak. The tankering, pipelining, and other shore-base demands of this alternative do not distinguish it from the Nome onshore case as it relates to subsistence use in the Sledge Island to Golovin primary subsistence-use area.

Harvest Pressure and Other Sociocultural Impacts: In both this case and the proposal with the OCS population located in the Nome-Cape Nome area, competition for fish and game would be most intense in this general area and perhaps extending out to the Seward Peninsula generally. Unless contained by industry-community agreement and/or tight fish and game regulation, it is likely that conflicts over subsistence vs. sport use of fish and game could be intense, particularly during the peak 1986 to 1991 period. For a more detailed discussion of likely impacts, see the discussion under the proposal in Section IV.B.1.c.

Conclusion: Population expected would be moderated about 12-percent over the life of the field. Oilspill risk is moderated slightly for the Chirikof Basin targets but still remains high. Nome area targets show reduced risk to moderate or low levels of risk within 10 days. Harvest pressure appears to be a likely impact in this alternative and in the proposal.

Effect of Mitigating Measures: The differences between this alternative and the proposal are significant. See the discussion under the proposal, Section IV.B.1.c. Applicable measures would be the same.

Cumulative Effects: See the discussion under the proposal, Section IV.B.1.c.

Unavoidable Adverse Effects: See the discussion for the proposal, Section IV.B.1.c. The same effects would apply here, except that they would be moderated somewhat.

d. Impacts on Village Livelihood: This proposed deletion alternative would moderate but not fundamentally change the impacts expected under the proposal. See the discussions under the proposal for Village Livelihood, Subsistence, and Population (Sec. IV.B.1.a., c. and d.).

Conclusion: This alternative is not significantly different from the proposal in its effects on village livelihood. Impacts would be moderated during the peak impact period. Kinds of impacts would not change. Only the severity of disruption would be moderated, especially during peak development.

Effect of Additional Mitigating Measures: See the discussion under the proposal, impacts on subsistence, Section IV.B.1.c., and the subsistence section for this alternative, IV.E.1.c. Mitigating measures would be the same for this alternative.

Cumulative Effects: See the discussion under subsistence, Section IV.B.1.c., and for this alternative, IV.E.1.c. Effects of various energy projects would impact both cash and subsistence subsystems of the village social system.

Unavoidable Adverse Effects: This would be the same as discussed under subsistence, Section IV.E.1.c.

e. Impacts on Urban Infrastructure:

Introduction: Sources of information for the following discussion are: Policy Analysts, Ltd. (1980), Technical Report 53; Institute of Social and Economic Research (1980); Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models.

Housing and Residential Land Use: Increased demand for additional housing units and residential land would begin immediately after the proposed lease sale (Table IV.B.1.e.-1). These demands, however, are considerably less than those in the proposal. The peak demand in 1988 is for 384 housing units requiring from 62 to 123 additional residential acres. This is significantly less than in the proposal and is perhaps more reasonable in terms of accommodation by private developers and financiers, as the end result is less of a housing surplus than in Alternative I (proposal).

Utilities: Tables IV.B.1.e.-2 and IV.B.1.e.-3 forecast the requirements for utilities under this alternative. Nome's water supply would probably be adequate for this forecast period, although storage capacity must be increased. The proposed new sewage treatment facility would probably be adequate for the forecast period.

Electrical generation would not be sufficient to meet the peak demands under this forecast and would probably require additional generating capacity. Telephone service demand increases would require the installation of solid state switching equipment.

Public Safety: This forecast requires the addition of sworn officers (see Table IV.B.1.e.-4). Additionally, some added detention facilities are required (Table IV.B.1.e.-5).

The present water-distribution system is inadequate to meet the present fire flow requirements. Under this case, the requirements are increased (Table IV.B.1.e.-6).

Education: This case requires both additional teachers and additional facilities (Table IV.B.1.e.-7). This forecast increase in student population, as in Alternative I, peaks in the mid-1980's. The increase is not as great as in the proposal, and the school system could allow the student-teacher and student-classroom ratios to rise somewhat as a means of dealing with the peak requirement.

Health Care: Using the same ratios as in Alternative I, there is an increase in demand for acute-care beds in the mid-1980's, as well as the need for an additional physician throughout the forecast period. The demand for increased beds is not as severe in this alternative as in Alternative I, and the peak need could be met through the use of temporary facilities.

Public Revenues: Although not as severe as in Alternative I, Nome's ability to finance additional services required by OCS development has some shortcomings. With the community's current inability to upgrade its public utilities, this problem would be compounded by OCS development. As in Alternative I, Nome would have to rely on increased state and federal funds, or increase its own mill levy, short of successful annexation of OCS onshore facilities to increase its own tax base.

Summary: Housing shortages would peak in 1988 with an additional 384 units required over the no sale alternative. This is significantly less than the 1,023 unit requirement for Alternative I (the proposal). Housing requirements will decrease thereafter to 116 units in 2000.

Although lack of building sites remains a problem (62 to 123 acres needed) much less acreage is required than for the proposal (165 to 326 acres). Lack of road access and limitations on water and sewage services to homes remain, although problems are less severe due to fewer homes.

Water storage and electric generating capacity would need to be increased. However, the water supply and sewage treatment facility will be adequate. Additional personnel and facilities will be required for health care, public safety, and education.

Public revenue problems, though not as severe as in Altenrative I, remain. Nome would need increased state or federal funds or increase its own mill levy.

Conclusion: Approximately 380 additional dwellings would be required by 1988, the peak year of onshore activity, which could create an acute short-term housing shortage at the local level. Anticipated shortages in housing could cause significant inflated housing costs, possibly forcing low income residents into dilapidated housing units or out of Nome and creating problems in providing public utility services to many new units. Longer-term impacts

associated with the surplus housing units and infrastructure are less significant for this alternative (about 250 units) than for Alternative I (about 850 units).

Effect of Additional Mitigating Measures: Should Section 308 (Coastal Energy Impact Program) of the Coastal Zone Management Act should be reauthorized, funds could be used by the community to assist in providing certain public services which the community might otherwise be unable to finance itself.

Alaska Statues, Chapter 06, Emergency Residential Rent Regulation and Control, provides a substantial degree of housing protection to residents of the Nome area. This statute establishes authority for the Governor of Alaska to issue a proclamation of housing emergency for any part of the state. During a housing emergency, no landlord within the geographic area covered by the proclamation may raise housing rents or evict a tenant in violation of regulations established by the Commissioner of the Alaska Department of Commerce under the provisions of AS 34.06.

Cumulative Effects: The Port of Nome Deepwater Terminal; the Lost River Mining Project; and, to a lesser degree, State of Alaska sale 38, would all impact Nome. The cumulative effect of these projects, when combined with this alternative, increases the degree of the impacts on Nome's infrastructure by increasing population and the attendant increased demand for housing and public services.

Unavoidable Adverse Effects: As with Alternative I, a housing shortage would cause inflated housing costs and the community would probably be unable to provide public utilities to new housing units. The community would probably be unable to finance increased public-service demands resulting from this alternative.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat:

In general, impacts to the Yukon River Delta under this alternative would be similar to those of the proposal (Sec. IV.B.2.a.). The deletion of blocks in the northern part of the lease area would slightly decrease the risks of oilspills contacting the Yukon Delta or the Yukon Delta entrainment area (refer to Appendix J, Tables 9, 10, 17, and 18).

Conclusion: Should a large oilspill contact the Delta simultaneously with a storm-surge event, oil could be driven inland onto higher marsh surfaces where it could persist for 5 to 10 years with resultant long-term (chronic) effects on the biota (principally waterfowl and fish) of these marsh habitats. The effects would more likely be local and are not anticipated to result in regional impacts. The intensity of these effects would depend on the size and location of the affected area. The likelihood of such an event is considered very low because of the unusual set of circumstances that would have to occur simultaneously by chance.

Effect of Additional Mitigating Measures: The mitigating measures that relate to the Delta should be as effective without the northern blocks as they are with the proposal.

Cumulative Effects: The cumulative effects without the northern blocks, which are far from the Delta, should be the same as the cumulative effects for the proposal (Sec. IV.B.2.a.).

Unavoidable Adverse Effects: The unavoidable effects on the Delta without the northern blocks should be the same as with the proposal (Sec. IV.B.2.a.).

b. Impacts on Fish Resources: Deletion of the the blocks in the northern portion of the proposed lease area would slightly reduce the probability of oilspill risk to the nearshore fisheries around inner Norton Sound and the Yukon Delta. A significant reduction in oilspill risk would occur for the king crab concentration area off Cape Nome in either transportation scenario (Appendix J, Tables 9 and 10). For example, under the onshore transportation scenario, the probability of a spill of 1,000 barrels or greater contacting this area within 10 days under the onshore transportation scenario is 43-percent for the proposal and 24-percent for the northern deletion alternative. Given the low probability of spill occurence, the conclusions under this alternative would be similar to those of the proposal.

Additionally, with the reduction in total area leased, ocean space use conflicts between the petroleum and commercial fishing industries would decrease. These impacts would still be insignificant.

Conclusion: Impacts on the Yukon River Delta for this alternative would be the same as the proposal (see Sec. IV.B.2.a.).

Effect of Additional Mitigating Measures: The effectiveness of mitigating measures for this alternative would be the same as the proposal. (See Sec. IV.B.2.b.)

Cumulative Effects: Cumulative effects would be the same as those of the proposal. (Refer to Sec. IV.B.2.b.)

Unavoidable Adverse Effects: Unavoidable adverse effects would be the same as those of the proposal. (Refer to Sec. IV.B.2.b.)

c. Impacts on Birds: This alternative reduces the overall probabilities of an oilspill contacting coastal habitats by about 40 percent from that of the proposal. Slight risk reductions to the coastline from Cape Nome to Rocky Point are indicated (Appendix J, Tables 15 and 17; Fig. IV.A.4.c.-3).

There could be a noticeable reduction in risks to the seabirds and their foraging habitat at the Bluff as well as adjacent colonies during the summer (Tables 7-10, target S.B.D. For. 3 Sum., Fig. J-2, Appendix J). However, moderate risks (14 percent) are still present from the onshore development scenario with this alternative. The offshore loading scenario could substantially reduce these risks to this seabird foraging area, both with this alternative and with the proposal (Tables 7-8 and 9-10). Sledge Island seabird foraging area (Fig. J-2, Appendix J) shows a substantial reduction of oilspill contact with this alternative than with the proposal (Tables 7 and 9, target SBD. For. 2 Wint.). However, most of the risks to this target come from the onshore tanker facility and pipelines to shore at Cape Nome. The northern deletion shows about the same overall risk to the Yukon Delta intertidal

waterfowl and shorebird habitat as the proposal. Most of the conditional risks to the Yukon Delta come from the southern blocks.

Deleting the northern blocks could reduce the chances of aircraft disturbance on the seabird colonies in the Bluff area east of Cape Nome and reduce the disturbance of nesting waterfowl and shorebirds in the Safety Lagoon area from that of the proposal.

Conclusion: Potential oilspill and disturbance interactions with birds and their habitats along the Seward Peninsula could be reduced somewhat from those under the proposal. However, if a major oilspill occurs, substantial local impacts are still likely to occur (see proposal Sec. IV.B.2.c.). Significant long-term regional impacts are as unlikely as they are under the proposal.

Effect of Additional Mitigating Measures: See discussion under the proposal (Sec. IV.B.2.c.).

Cumulative Effects: The additive effects of other projects described in the cumulative effects on the proposal, especially other oil and gas activities in addition to this alternative, could have major, long-term effects on birds in the northern Bering Sea region. The cumulative effects of this alternative are about the same as those described in the proposal.

Unavoidable Adverse Effects: This alternative would have approximately the same unavoidable effects as the proposal. (Refer to Sec. IV.B.2.c.)

d. Impacts on Marine Mammals: See Section IV.B.2.d. for a general discussion of potential direct and indirect impacts on marine mammals. (Unless otherwise specified, oilspill contact probabilities referred to in this section assume the occurrence of development to the extent estimated herein [Sec. II.A.] and associated spill contact rates [Samuels and Lanfear, 1981].)

Attention is directed to 10-day trajectories of spills greater than 1,000 barrels. Comparison of Appendix J, Tables 15 and 17, indicates that this alternative would do little to reduce oilspill risk to the spotted seal and walrus hauling areas around the perimeter of Norton Sound (e.g., in the vicinity of Cape Nome, Rocky Point, Cape Darby, Cape Denbigh, Besboro Island, Stuart Island, and near St. Michael). In general, no reduction in risks to shorefast ice habitats of ringed seal would be afforded by this alternative. However, offshore areas in northern Norton Sound would sustain less risk under this alternative. Under Alternative I (Appendix J, Table 7), in summer, the latter area would be under a 35-percent chance of spill contact. Under this alternative, it would be under only a 19-percent risk (Appendix J, Table 9). In winter, the same comparison would be 19-percent (Alternative I) versus 9-percent (Alternative IV). Therefore, although land segments or shorefast ice may not be afforded significant reductions in risk by this alternative, these data indicate that the probability of spills intersecting offshore areas of northern Norton Sound may be reduced by 10- to 16-percent. Areas in southern Norton Sound (Mid-boundary target No. 3) show only a 3- to 7-percent reduction in risk under Alternative IV as compared to the proposal. Therefore, seals, walrus, and other marine mammals which occupy offshore areas of northern Norton Sound and the northern Bering Sea northwest of the proposed sale area would be afforded a limited amount of protection from oilspills as a result of this

alternative as compared to the proposal. However, these reductions are not as great as those that would be afforded under Alternative V (see Sec. IV.F.2.d.).

Comparison of risk to land segment 30 under the proposal (Appendix J, Table 15, 21-percent) versus this alternative (Appendix J, Table 17, 15-percent) shows that the risk to eastern St. Lawrence Island marine mammal habitats would be reduced but, again, not as much as the reduction that would occur under Alternative V.

Examination of mid-boundary target No. 5 (comparing the alternative to the proposal, Appendix J, Table 7 versus 9), indicates that risk of spills moving toward important offshore habitats to the northwest of the lease area in winter may be reduced as much as 23-percent (Mid-boundary target No. 5, 53-percent proposal, 30-percent Alternative IV), but such reduction of risks would not be as much as the reduction afforded under Alternative V (see Section IV.F.2.d.). Similarly, spills moving through areas immediately southwest of the proposed lease area in winter (Mid-boundary target No. 4) would be afforded some reduction of risk (Appendix J, Table 7 versus 9, 26-percent proposal versus 18-percent Alternative IV). Eventual travel of spilled oil beyond the boundaries of the simulation area (e.g., beyond segment 28 to the west or segments 32-33 to the far southwest) are of low to moderate probability (3- to 13-percent) versus low-high probability for the proposal. In consideration of these data, it is unlikely that long-term, significant oilspill impacts at coastal hauling areas would occur within the boundaries of Norton Sound. Under this alternative, however, there is a moderate chance that spills could move into offshore areas of the northern Bering Sea and, thereby, possibly result in at least temporary disruption of normal marine mammal distribution. Also, eastern St. Lawrence Island walrus hauling areas would remain at a moderate level of risk, suggesting that this alternative reduces only to a limited extent overall risk to these important habitats.

Since overall industrial activity would be reduced under this alternative, especially in northern Norton Sound, disturbance of marine mammals would be reduced in that area. Although such reductions are unlikely to have major implications to regional marine mammal productivity, such reduced impacts could be of importance to those who harvest marine mammals in northern Norton Sound (see Sec. IV.F.1.c.).

As for the proposal, coastal hauling areas around the perimeter of Norton Sound occupied seasonally by spotted seal or walrus and areas of shorefast ice (constituting breeding habitats of ringed seals), are at a low level of risk to oilspill contact under Alternative IV. Seals, walrus, and other marine mammals which occupy offshore areas of northern Norton Sound and the northern Bering Sea would be afforded only a limited amount of protection from oilspills as a result of this alternative, as compared to the proposal. However, since eastern St. Lawrence Island walrus hauling areas and important marine mammal habitats of oceanic environments immediately west of the Sound (and western blocks proposed to be leased) would remain at a moderate-high level of risk, localized direct and indirect impacts could occur.

Conclusion: The impacts on marine mammals would probably not be significantly different from those which would be associated with the proposal.

Effect of Additional Mitigating Measures: Effectiveness of mitigating measures, especially those specifically intended to minimize impacts on marine mammals, would remain as effective as discussed in Section IV.B.2.d.

Cumulative Effects: The contribution to and potential significance of cumulative effects on marine mammals associated with this alternative would be essentially the same as those of the proposal, although some localized reduction of impact of indeterminant extent may be afforded.

Unavoidable Adverse Effects: Unavoidable adverse effects would be essentially the same as those discussed for the proposal (Sec. IV.B.2.d.).

e. Impacts on Endangered Species: See Section IV.B.2.e. for a general discussion of potential direct and indirect impacts on endangered species. (Unless otherwise specified, oilspill risk analyses made in this section refer to probabilities conditional on the development of a production field, as presumed in Section II.A., and to associated spill-contact rates (Samuels and Lanfear, 1981).)

Attention is directed to 10-day trajectories of spills greater than 1,000 barrels. Appendix J, Tables 9 and 10, shows that under this alternative there would be approximately a 24- to 28-percent reduction in risk of spills greater than 1,000 barrels hitting a portion of the Chirikov Basin gray whale feeding area (Fig. J-4), as compared to the proposal. As compared to the proposal, there would be a 6- to 8-percent reduction of risk to eastern St. Lawrence Island gray whale habitats (Appendix J, comparing Table 17 to Table 15 and Table 18 to Table 16, segment 30). These reductions would not be as great as those afforded by Alternative V. (See Section IV.F.2.e.) As for the proposal, risk to the Chirikov Basin feeding area associated with onshore transportation is slightly more than would be incurred under offshore transportation (Appendix J, Tables 9 and 10, 51-percent vs. 47-percent). Risks to eastern St. Lawrence Island habitats are slightly less for onshore transportation than those associated with offshore transportation (Appendix J, Tables 17 and 18, 15 percent vs. 21-percent, segment 30). In spite of the reduction in oilspill risk to gray whale feeding areas afforded by this alternative (as compared to the proposal), the absolute magnitude of risk to important areas would still be relatively high (Appendix J, Table 9, Gray Whale Area, 51-percent; Table 18, eastern St. Lawrence Island segment 30, 21 percent). As assumed herein (Section II.A.; Samuels and Lanfear, 1981), only gas and not oil is believed present in southern blocks. In the unlikely situation that oil would be found therein, risks to the St. Lawrence Island area would probably be even greater. Thus, in the event of development, there would still be a relatively high probability that spills associated with this alternative would move into the Chirikof Basin gray whale feeding area, and at least a moderate chance that spills would hit eastern St. Lawrence Island habitats. It is impossible at present to predict the state of all variables which would determine the ultimate significance of such vulnerability. Nevertheless, it is possible that such interaction could have localized, short term impacts on gray whale productivity through change in feeding habitat, quality, or quantity. As for the proposal, direct effects such as fouling of baleen or tissue injury may occur if whales cannot avoid spilled oil.

Examination of Appendix J, Table 18 (segments 25, 26, and 27) shows that under this alternative, movement of spills northward toward the Bering Strait is very

unlikely, suggesting that endangered whale populations funneling through the strait are relatively unlikely to be vulnerable to spills (due to the proposal or alternatives) moving in that direction. This alternative would reduce by about 10 percent (as compared to the proposal) the probabilities of spills moving towards major bowhead migratory corridors (Appendix J, Table 17, segments 27-29, 6- to 13-percent chance). It is impossible to predict how such a difference may ultimately be related to overall spill impact on bowhead whales, except to say that this alternative may reduce the risk of such impacts to a small extent. Potential impacts due to disturbance of endangered whales are essentially the same for this alternative as those described in the proposal (although perhaps to a lesser extent since the general level of development activities would be reduced [see Sec. II.A.] in comparison to the proposal). This alternative would reduce by about one and one half (Appendix J, Table 17, 3-percent chance vs. Table 15, 6-percent chance, segment 23) the probabilities of spill contact in the vicinity of Sledge Island, a known peregrine falcon nesting habitat. No additional protection from spills would be afforded the Topkok Head potential nesting area, however. Since probability of spill contact due to Alternative I is already relatively low in peregrine nesting habitats, this alternative does not afford significant additional protection to peregrine nesting habitat along the Norton Sound coastlines. Impacts due to disturbance of peregrine nesting areas associated with this alternative, as for the proposal, are unlikely, assuming the relevant Information to Lessees is adopted.

Conclusion: It is very likely that there would be contact of gray whale feeding habitat with oilspills. This could be manifested by at least temporary avoidance of affected areas or by localized reduction of productivity of benthic gray whale food organisms. It is unlikely that major bowhead migratory corridors would be directly affected by oilspills. The magnitudes of such effects cannot be quantified at this time. It is possible that endangered whales would be affected detrimentally by disturbance, especially those species for which little index of tolerance to human activity exists or for which major population segments occur near the proposed sale area, i.e., bowhead whales. It is unlikely that sale-related activities associated with exploration phases of this alternative would significantly impact endangered whales. Significant direct impacts due to oilspills during all project phases on peregrine falcons are unlikely. Alternative IV may reduce impacts to endangered whales to a limited extent as compared to Alternative I, but localized risks associated with Alternative IV would still be relatively high in gray whale feeding areas.

Effect of Additional Mitigating Measures: Effectiveness of mitigating measures would be essentially the same as discussed in Section IV.B.2.e.

Cumulative Effects: The contribution to, and the potential significance of, cumulative effects on endangered species associated with this alternative would be essentially the same as those of the proposal, although some localized reduction of indeterminant extent may be afforded.

Unavoidable Adverse Effects: Unavoidable adverse effects associated with this alternative would be essentially the same as those discussed for the proposal.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: Neither the original proposal nor this alternative would have major economic impacts on areas of Alaska outside the Nome census division. Therefore, the general economic impacts which would result in other areas of the state are not discussed in the text of this document. However, possible oilspills could impact the lower and upper Yukon salmon fisheries and other Yukon Delta wildlife resources described in Section III.D.1. The probability and degree of impact of possible oilspills are discussed in Section IV.A.4.

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): Deletion of the northern blocks would reduce substantially the expected finds of oil and gas and would reduce the economic impacts on the Nome census division. However, these economic impacts would still be very large. The peak employment impact would be about half as great as for the proposal. Projected impacts of this alternative are compared to impacts of the original proposal in Table IV.E.3.b.-1. Refer to Section IV.B.3.b., which discusses the proposal, for an explanation of the different categories of employment impact and for information about economic problems which are expected to accompany OCS development.

Conclusion: Refer to Table IV.E.3.b.-1 for specific employment and population projections. General conclusions are as stated in Section IV.B.3.b. for the proposal.

Effect of Additional Mitigating Measures: Refer to Section IV.B.3.b.

Cumulative Effects: See Section IV.B.3.b.

Unavoidable Adverse Effects: Refer to Section IV.B.3.b.

F. Alternative V - Eastern Deletion (248 Blocks)

This alternative suggests the deletion of 181 blocks in the eastern half of the proposed sale area (see Fig. II.B.5.a.-1). The following sections assess the impacts of oil and gas leasing for Alternative V.

1. Impacts on Social Systems:

a. Impacts on Population: This alternative would delete 181 blocks in the eastern portion of Norton Sound, reducing by 42-percent the total area of the proposed sale, reducing by 80-percent the amount of recoverable oil, and reducing by 75-percent the amount of recoverable gas for the proposal. The social impacts associated with reductions in potentially offered blocks assumes an offshore loading scenario which is considerably different from the onshore scenario of the proposal and other alternatives. The eastern deletion alternative provides the most drastic change in OCS development conditions of all the alternatives considered, including the proposal. OCS population projected is reduced substantially and is presumed to be largely based offshore, reducing the interaction effects likely to occur with onshore development.

Under this alternative, population impacts in the 5th year of the development (1987) are 1,539, a 36-percent reduction over the proposed 2,387 for that year.

Table IV.E.3.b.-1
Comparison of Employment and Population Impacts of Alternative IV
To the Impacts of the Proposal

Year	(1)	(2)	(3)	(4)	(5)
	Proposal (No Blocks Deleted)				
	New Jobs Caused Directly & Indirectly by OCS Activities				Population Increase Resulting From OCS Activities (Excluding Commuters)
	Petroleum Jobs Filled By Commuters[1/]	All Jobs Filled By OCS In-Migrants[2/]	Jobs Filled By Persons Who Would Have Been In the Nome Area in the Absence of OCS[3/]	Total New Jobs	
1981	0	0	0	0	0
1982	0	0	0	0	0
1983	664	0	255	919	228
1984	1,408	21	309	1,738	443
1985	2,729	287	352	3,368	1,105
1986	2,385	460	333	3,178	1,617
1987	2,588	800	327	3,715	2,387
1988	2,912	1,110	371	4,393	3,169
1989	1,527	839	376	2,742	2,755
1990	1,077	435	317	1,829	1,676
1991	868	199	304	1,371	998
1992	801	90	310	1,201	693
1993	814	45	315	1,174	571
1994	832	29	320	1,181	533
1995	801	20	324	1,145	510
1996	799	8	329	1,136	484
1997	801	5	329	1,135	432
1998	814	4	330	1,148	429
1999	832	3	334	1,169	431
2000	801	2	334	1,137	428
Year	Alternative IV (Deletion of Northern Blocks)[4/]				
1981	0	0	0	0	0
1982	0	0	0	0	0
1983	209 (31 %)	0	97 (38 %)	306 (33 %)	,3 (36 %)
1984	756 (54 %)	0	159 (51 %)	915 (53 %)	182 (41 %)
1985	1,584 (58 %)	56 (20 %)	315 (89 %)	1,955 (58 %)	536 (49 %)
1986	1,663 (70 %)	162 (35 %)	302 (91 %)	2,127 (67 %)	814 (50 %)
1987	1,449 (56 %)	204 (26 %)	301 (92 %)	1,954 (53 %)	970 (41 %)
1988	1,630 (56 %)	277 (25 %)	329 (89 %)	2,236 (51 %)	1,187 (37 %)
1989	1,310 (86 %)	250 (30 %)	315 (84 %)	1,875 (68 %)	1,137 (41 %)
1990	782 (73 %)	188 (43 %)	333(105 %)	1,303 (71 %)	993 (59 %)
1991	703 (81 %)	73 (37 %)	323(106 %)	1,099 (80 %)	659 (66 %)
1992	826(103 %)	39 (43 %)	325(105 %)	1,190 (99 %)	559 (81 %)
1993	941(116 %)	28 (62 %)	319(101 %)	1,288(110 %)	529 (93 %)
1994	691 (83 %)	11 (38 %)	322(101 %)	1,024 (87 %)	485 (91 %)
1995	666 (83 %)	0	297 (92 %)	963 (84 %)	378 (74 %)
1996	641 (80 %)	0	288 (88 %)	929 (82 %)	365 (75 %)
1997	770 (96 %)	0	290 (88 %)	1,060 (93 %)	368 (85 %)
1998	930(114 %)	0	320 (97 %)	1,250(109 %)	409 (95 %)
1999	680 (82 %)	0	314 (94 %)	994 (85 %)	400 (93 %)
2000	655 (82 %)	0	283 (85 %)	938 (82 %)	357 (83 %)

1/ Figures in column 1 refer to oil-related jobs held by commuters (workers recruited from outside the Nome census division, who would fly to residences far removed from the Nome area during periods of rest). While on duty in the Nome area, commuters would be housed in company dormitories either offshore or at a site outside the present limits of the city of Nome. Because these commuters would have a minimal impact on the local economy, they are omitted from projections of population increase shown in column 5. Please note that figures in column 1 represent the number of commuters who would be on duty in the Nome area on any given day. The total number of commuters, including those who on a given day would be residing outside the Nome area during a period of rest, are substantially larger than the figures in column 1.

2/ Figures in column 2 refer to jobs of all types caused directly or indirectly by OCS development, including oil-related jobs and jobs in retail trade and services or in local government, which are filled by persons in the OCS in-migrant category. OC S in-migrants include all persons (except commuters) attracted to the Nome area due to improved employment opportunities resulting from OC S development. These figures include jobs held by workers brought to the Nome area by the oil companies, as long as these workers actually reside in the Nome area (unlike commuters).

3/ Figures in column 3 refer to jobs of all types caused directly or indirectly by OCS development, including oil-related jobs and jobs in retail trade and services or in local government, which are filled by persons who would have been in the Nome area in the absence of OCS development.

4/ Figures in parentheses refer to the impact of Alternative IV as a percentage of the impact of the proposal.

Source: Output of the SCIMP model of the Institute of Social and Economic Research, University of Alaska, based on petroleum development figures supplied by Alaska OCS Office. The model also employed certain assumptions developed by the Alaska OCS Office, as well as assumptions which are an integral part of the SCIMP model.

In the offshore case, the 5th year contains peak population levels. Subsequent OCS population levels are 1,488; 1,197; and 709 in 1988, 1989, and 1990. These levels represent reductions of 53-percent, 57-percent, and 74-percent, respectively, in additional OCS population projected for the Nome area over projections for the proposal. During peak impacts, this is a significant reduction. Another sizable difference between this alternative and the proposal results from reduction in the duration of peak impacts from seven under the proposal to five with this alternative. Except for these differences, this alternative provides a moderation in the level and intensity of boom-town growth conditions already discussed under the proposal, rather than a difference in kind. For further discussion, see the analysis under the proposal.

This alternative significantly reduces the assumed impacting population from the proposal or any other alternative. Offshore loading may also affect the location of the workers and other OCS support anticipated for the Nome-Cape Nome area. (Refer to the discussion under subsistence and infrastructure for this alternative, Sections IV.F.1.c. and e.

Conclusion: This alternative reduces by over 50-percent the levels of peak population impact projected under the proposal. It also reduces the duration of the peak period from 7 to 5 years. Other changes expected are moderations of predicted changes discussed under the proposal.

Population impacts are significantly reduced with this alternative, making it more like the exploration phase than any of the development phase alternatives, including the proposal.

Effect of Additional Mitigating Measures: See the discussion under Sections IV.B.1.c. and e.

Cumulative Effects: Cumulative effects would be the same as those discussed for the proposal. (Refer to Sec. IV.B.1.a.)

Unavoidable Adverse Effects: A growth rate of 4-percent over the period would not pose serious unavoidable adverse effects to the area.

b. Impacts on Sociocultural Systems: This proposal reduces sociocultural impacts on Unalakleet, Shaktoolik, Elim, Koyuk, Stebbins, and St. Michael, should any exploration activity or interaction indirectly impact them.

Conclusion: Since it is expected that offshore loading would occur in the development phase after exploration, for this alternative the total regional impacts on the Norton Sound area would be reduced.

Effect of Additional Mitigating Measures: If the suggested Orientation Program measure contained discussions of the present people, their institutions, the function of those institutions and groups, and the effects that contacts by OCS-related employees in the villages could have, then (with increased understanding) the orientation program could lessen the impacts. It but could not, however, totally mitigate them.

Cumulative Effects: Since the lease area under this alternative is along the east shore of Norton Sound, the proposed Alaska state sale could appreciably

interact with the impacts of exploration and development for the proposed federal sale. Thus, there would be some reduction in cumulative impacts by the eastern deletion. Reduction of impacts would make cumulative impacts minimal.

Unavoidable Adverse Effects: This alternative produces unavoidable adverse effects similar to the proposal. These effects for the villages are lowered only slightly by this deletion.

c. Impacts on Subsistence Patterns:

Oilspill Risk: This alternative reduces substantially the risk to the six oilspill targets identified in the discussion under the proposal. Under this alternative, only the gray whale feeding area and winter mid-boundary No. 4 targets off the Northeastern Cape and the Punuk Islands maintain significant oilspill risk within a 10-day period. Therefore, risk to Savoonga and, to a lesser extent, Gambell, Diomede and King Islands would continue. However, risk to other village subsistence-use areas and primary subsistence species would be reduced.

Onshore Impacts: The population demands of this deletion alternative are small, compared to the proposal. For the most part, impacts are only slightly larger than the exploration phase of the proposal, peaking at an additional 425 resident OCS population in 1990 but ranging closer to 200 for the period of exploration and development as a whole. These population impacts would not significantly affect subsistence activities, as is the case for the proposal. Since development under this alternative is assumed to take place offshore, there would be a reduction in interference with subsistence activities associated with the Nome onshore base. This offshore base could presumably house oil workers at the base, providing greater separation between OCS-related workers and the onshore villages and towns of the Norton Sound region. From this standpoint, this alternative might provide more complete enclave conditions which might encourage less uncontrolled fish and game exploitation in off hours. The enclave conditions of the offshore case might also reduce other social impacts to the Nome-Cape Nome area, discussed in greater detail in the infrastructure section (IV.F.1.e.). These enclave conditions would also reduce the interaction effects assumed to occur with the introduction of industrial populations into a predominantly subsistence-based region, discussed in the following paragraph.

Harvest Pressure and other Sociocultural Impacts: OCS-related population, and associated dependents, is much smaller in this alternative. Their presumed location offshore would reduce the interaction effects which encourage escalation of subsistence and commercial harvesting of local fish and game. If jobs for local residents were available in the offshore case, these jobs and resulting cash could affect subsistence hunts, but this would be less likely than under the proposal or other onshore alternatives.

Summary: Since this alternative assumes offshore basing of oil and gas development activity, population associated with OCS support could be totally or substantially enclaved offshore, with relatively minimal contacts at airports and other transportation points being the major source of interaction with local populations. Another benefit of offshore loading from a social perspective is the greater control industry could exercise over the off-hours behavior

of workers, if they are enclaved. If this extended to off hours local fishing and hunting activity, it could be a significant reduction from the proposed onshore mean case. Under this alternative, Savoonga and, to a lesser extent, Gambell (as well as Diomede and King Island villages that are dependent on walrus and whales) would maintain higher risk of a probable oilspill to their primary use area and resources. Other Norton Sound villages would be much less likely to suffer these risks.

Conclusion: From the standpoint of oilspill risk, this alternative is significantly different from the proposal, reducing substantially the risk to all the high-risk targets, except those close to the eastern shores of St. Lawrence Island. From the standpoint of onshore impacts and harvest pressure, impacts anticipated under the proposal would be significantly moderated. Native participation in offshore work is assumed to be less likely, thus reducing some of the pressures toward commercialization more likely to occur with the proposal.

Effect of Additional Mitigating Measures: See the discussion under the proposal, Section IV.B.1.c.

Cumulative Effects: Refer to the discussion under the proposal (Sec. IV.B.1.-c.).

Unavoidable Adverse Effects: Refer to the discussion under the proposal, Section IV.B.1.c. The same effects mentioned would apply here, except that they would be substantially moderated.

d. Impacts on Village Livelihood: With this alternative, the potential effects on villages in Norton Sound would be reduced if there were a corresponding reduction in village participation in OCS and related work. This would probably occur under the scenario for this alternative, given lower population demands forecasted and the greater distance of the offshore work force and activity from normal village activities.

The reduction in platforms, pipelines, and resulting oilspill risk is discussed in Section IV.F.1.c. Any significant impacts on salmon or herring would affect village economies that are dependent on these commercial fisheries. Effects on walrus and seals would affect village income from ivory and other craft sales. See the discussion under the proposal (Sec. IV.B.1.d.).

Conclusion: This alternative would reduce impacts on village economies, both by reducing population and related onshore development, and by reducing the number of platforms, pipelines, and associated oilspill risk. For a discussion of oilspill risk, see the analysis for biological resources (Sec. IV.F.2.) and the subsistence section (IV.F.1.c.).

Effect of Additional Mitigating Measures: See the discussion under the proposal on subsistence (Sec. IV.B.1.c.) and village livelihood (IV.B.1.d.).

Cumulative Effects: Refer to the discussion under the proposal on subsistence (Sec. IV.B.1.c.), village livelihood (IV.B.1.d), and subsistence under this alternative (IV.F.1.c.).

Unavoidable Adverse Effects: These would be the same as for subsistence (Sec. IV.F.1.c.).

e. Impacts on Urban Infrastructure:

Introduction: Sources of information for the following discussion are: Policy Analysts, Ltd. (1980), Technical Report No. 53; Institute of Social and Economic Research (1980), Bering-Norton Base Case and Impact Results from the MAP and SCIMP Models. This discussion assumes an offshore loading operation requiring only limited onshore facilities and/or activity.

Housing and Residential Land Use: Increased demand for additional housing units and residential land would begin 1 year after the proposed lease sale. These demands, however, are significantly less than those in Alternative I. The peak demand in 1989 would be for 137 additional housing units, requiring from 22 to 44 additional residential acres. It is reasonable to believe that this demand could be accommodated as the end result constitutes a surplus of only 85 housing units at the end of the forecast period. Due to Nome's current housing shortage, these units could hardly be considered surplus.

Utilities: Under this alternative, Nome's water supply should be adequate for the forecast period, although storage capacity should be increased. The proposed new sewage treatment facility should be adequate for the forecast period.

Electrical generation would not be sufficient to meet the peak amounts under this forecast and would probably require additional generating capacity. Telephone-service-demand increases would require the installation of solid-state switching equipment.

Public Safety: This alternative does not require additional sworn officers or detention facilities. Fire flow requirements are not currently met; this forecast mildly increases the requirements.

Education: This alternative requires both additional teachers and additional facilities. These additional requirements are significantly less than Alternative I. By allowing the teacher/student and classroom/student ratio to rise during the peak in 1989, the system would only require the addition of two teachers and two classrooms over the forecast period.

Health Care: Under this alternative, not more than two additional acute-care beds would be required to meet the peak requirements in 1989. No additional physicians would be required.

Public Revenues: The financing of additional service demands under this alternative would be a very minor problem for Nome.

Summary: Housing demands for this alternative are minimal (137 additional units). The 85 surplus units at the end of the forecast period could be used to alleviate Nome's current housing shortage.

Water supplies and sewage treatment facilities would be adequate to meet peak needs. Water storage facilities, electrical generation, and phone service would need to be upgraded.

No additional personnel or facilities would be needed to meet public safety needs. Limited facility expansion would be needed to meet health care needs and limited facility and personnel additions would be required over the forecast period.

Conclusion: The impacts to Nome under this alternative would be almost nonexistent. While some shortages of housing might occur, it is probable that the long term effects of peak housing demands might help to eliminate Nome's current housing shortage.

Effect of Additional Mitigating Measures: None are required.

Cumulative Effects: The Port of Nome Deepwater Terminal; the Lost River Mining Project; and, to a lesser degree, State of Alaska sale 38, would all impact Nome. These projects, taken collectively, would probably have a more significant impact on the Nome infrastructure than this alternative.

Unavoidable Adverse Effects: The long-term effect to the community would be an increase of 4 percent in population over the forecast growth of the community without this proposed lease sale alternative. The increased infrastructure demands attributable to this growth should be easily accommodated by the community.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat: The effects on the Delta would be less with the eastern deletion than with the proposal. The deletion of blocks in the eastern part of the lease area would decrease the risks of oilspills contacting the Yukon Delta or the Yukon Delta entrainment area (refer to Appendix J, Tables 13, 14, 21, and 22).

Conclusion: Should a large oilspill contact the Delta simultaneously with a storm-surge event, oil could be driven inland onto higher marsh surfaces where it could persist for 5 to 10 years with resultant long-term (chronic) effects on the biota (principally waterfowl and fish) of these marsh habitats. The effects would more likely be local and are not anticipated to result in regional impacts. The intensity of these effects would depend on the size and location of the affected area. The likelihood of such an event is considered very low because of the unusual set of circumstances that would have to occur simultaneously by chance.

tat may persist for 2 or more years, signficant biomass reductions are not expected. Regional impacts (short- or long-term) to the fish of Norton Sound are not anticipated.

Effect of Additional Mitigating Measures: The effectiveness of most of the mitigating measures that relate to the Delta should be the same without the eastern blocks as with all of the blocks (i.e., the proposal). One suggested mitigating measure, the Information to Lessees on the Area of Special Concern (Yukon River Delta), applies only to blocks in the southeastern corner, which would be dropped if the eastern deletion were selected. (See Sec. II.B.1.c.)

Cumulative Effects: The reduction in risk to the Delta because of the eastern deletion would be greatly modified by the plans of the State of Alaska and

private groups to lease areas on or around the Yukon Delta. These plans would increase the risks of oilspills, construction activities, and industry personnel influx to the Delta region.

Unavoidable Adverse Effects: The unavoidable effects on the Delta without the eastern blocks should be the same as with the proposal (Sec. IV.B.2.a.).

b. Impacts on Fish Resources: This alternative would reduce the probability of oilspill risk to the nearshore fisheries around inner Norton Sound. Using the oilspill risk analysis assumptions, oilspill risks to the herring and salmon fisheries from the Yukon River Delta to the west side of Norton Bay (segments 1-16) would be eliminated completely. Therefore, major salmon and herring spawning and fishing areas in Norton Sound would not be threatened by this alternative. Additionally, a significant reduction in oilspill risk to the king crab concentration area off Cape Nome would be significantly reduced under either transportation scenario (Appendix J, Tables 13 and 14). For example, the probability for a spill, 1,000 barrels or greater, to contact this area within 10 days under the onshore scenario would be 43 percent for the proposal and 12 percent for this alternative.

The reduction in total area leased under this alternative would reduce the ocean-space-use conflicts that may arise between the petroleum and fishing industry. These impacts would still be insignificant.

Conclusion: Impacts to the fish resources of Norton Sound would result largely from oilspills contacting nearshore areas that are used by herring for spawning; by salmonids for spawning, rearing, and migration routes; and by king crab larvae for rearing. A large portion of the nearshore from the Yukon River Delta around inner Norton Sound to Golovin Bay would not be impacted by oilspills under this alternative. Should oil contact nearshore areas west of Golovin Bay, short-term (1-year) losses to local populations of herring, king crab, or salmon could occur. These events, however, are considered unlikely. Oil contamination near the mouth of a salmon spawning river could invoke avoidance responses by migrating adult or smolt salmon; however, this is not expected to result in a significant impact. Oil contamination of bottom sediments would result in a loss of habitat and fish prey organisms and a subsequent reduction in biomass of demersal fish populations in the affected areas. While the loss of habitat may persist for 2 or more years, significant biomass reductions are not expected. Regional impacts (short- or long-term) to the fish resources of Norton Sound are not anticipated.

Impacts on commercial fishing activities for this alternative would be the same as the proposal (see Sec. IV.B.2.b.).

Effect of Additional Mitigating Measures: The Orientation Program would be the only effective mitigating measure for fishery resources under this alternative (refer to Sec. IV.B.2.b.).

Cumulative Effects: Cumulative effects under this alternative would be similar to those of the proposal (refer to Sect. IV.B.2.b.).

Unavoidable Adverse Effects: Unavoidable adverse effects would be similar to those of the proposal (refer to Sec. IV.B.2.b.).

c. Impacts on Birds: This alternative reduces the overall unrisked probabilities of an oilspill contacting coastal habitats by about 80-percent from that of the proposal.

Oilspill conditional probabilities for contacting the coastal beaches and lagoons from Safety Lagoon to Rocky Point are practically eliminated with this alternative (Table 21, land segments 19 and 21, Appendix J). Substantial reduction in unrisked probabilities of a spill contacting the Bluff colony and adjacent seabird colony foraging area occur with this alternative (Tables 13 and 14, Appendix J, targets SBD. For. 3 SUM). The Sledge Island seabird foraging area oilspill risk was reduced from 16- to 36-percent with the proposal (Table 7) to 4- to 10-percent with this alternative (Table 13, Appendix J), although conditional risks from tanker traffic and pipelines in the western part of the proposed sale area would still exist. This alternative could greatly reduce risks of oilspills contacting the Yukon Delta (entrainment area, Appendix J, Fig. J-4) waterfowl and shorebird habitat from that of the proposal (Tables 7, 8, 13, and 14, Appendix J). Southeastern blocks showing the highest condition oilspill risk to the Yukon Delta (Tables 1, 2 and 3) would be deleted with this alternative. Oilspill contact probabilities (Tables 15 and 21) for bird habitats in the Chirikof Basin area and northeast St. Lawrence Island (water segments 26-30, Table 15, Appendix J) are substantially reduced, although most of the risk to this habitat and major seabird population may be from oil tanker traffic.

Disturbance of nesting seabirds and waterfowl along the coast of the Seward Peninsula from air and boat traffic may be reduced with this alternative.

Summary: Potential impacts to birds and their habitats along the Seward Peninsula and the Yukon Delta could be substantially reduced with this alternative compared to the proposal. If a major oilspill occurred, moderate local impacts would be likely to occur, although high local impacts would still be possible. Significant, long-term regional impacts would be very unlikely.

Conclusion: A major reduction in potential oilspill and disturbance interaction with marine and coastal birds and their habitats along Seward Peninsula, Sledge Island, and the Yukon Delta would occur with this alternative. However, substantial local impacts on birds could still occur even though it is less likely than under the proposal. Significant long-term regional impacts are very unlikely under this alternative.

Effect of Additional Mitigating Measures: Refer to discussion in Alternative I, Section IV.B.2.c.

Cumulative Effects: The cumulative effects of this alternative could be reduced slightly from those described in the proposal. However, the degree of impact from other projects could be the same as with the proposal.

Unavoidable Adverse Effects: The unavoidable adverse effects described in the proposal may be substantially reduced with this alternative.

d. Impacts on Marine Mammals: See Section IV.B.2.d. for a general discussion of potential impacts on marine mammals. (Unless otherwise specified, oilspill contact probabilities referred to in this section assume

the occurrence of development to the extent estimated herein [Sec II.A.] and associated spill rates [Samuels and Lanfear, 1981].) Attention is directed to 10-day trajectories of spills greater than 1,000 barrels.

As shown in Appendix J, Tables 13 and 21, shorelines and shorefast ice which are of importance to spotted seal, walrus, or ringed seal are under little if any risk of contact from oilspills under this alternative. In winter, offshore areas (mid-boundary targets) immediately south of Nome would be under only a 4-percent risk (as compared to 19 percent under the proposal); little, if any, risk in eastern Norton Sound; little, if any, in southern Norton Sound (as compared to 11-percent under the proposal); and from 4- to 16-percent (as compared to 26- to 53-percent under the proposal) immediately to the northwest or southwest of the alternative lease area (Appendix J, Table 13 versus Table 7, Mid-boundary targets Nos. 1-5). As shown in Appendix J, Table 21, there is very little (0- to 6-percent, segments 28, 30, 32, and 33) chance that oilspills would penetrate beyond the simulation boundary segments. Therefore, as compared to Alternatives IV or VI, this alternative reduces to the greatest extent (to low-moderate levels) the overall probability of spills moving within or out of the Sound. It thereby reduces to the greatest extent the chances that marine mammals would be affected directly or indirectly by spills.

Perhaps the most significant result of the Oilspill Risk Analysis is prediction that major marine mammal habitats of eastern St. Lawrence Island would be under only 3-percent risk as opposed to 15- or 21-percent shown for Alternatives I, IV, and VI. However, as for Alternatives I, III, and IV, southwestern-most blocks would be leased from which, if a spill occurred therein, it would be very likely that oil could reach sensitive areas offshore of St. Lawrence Island (see Appendix J, Table 5, location P1, segment 31, 27-percent chance). As compared to Alternatives I, III, IV, or VI, this alternative would reduce disturbance to the greatest extent within Norton Sound since overall development and production activities would be at their lowest level. Disturbance in the inner Sound area would be reduced to the greatest extent, suggesting that localized impacts in much of the inner Sound would be minimal, if existent. Although these potential reductions in impacts are not likely to have major implications to regional marine mammal distribution and population status, it is likely that localized noise and behavioral disturbance would be minimal under this alternative. Therefore, this alternative may have substantial reduction of impacts on subsistence harvest by inhabitants of the perimeter of Norton Sound. (See Sec. IV.F.1.c.)

Conclusion: As compared to the proposal, Alternative V provides substantial reduction of risks of direct and indirect short-term oilspill impacts on marine mammals frequenting offshore environments of Norton Sound and the northern Bering Sea, as well as walrus habitat of eastern St. Lawrence Island. According to the Oilspill Risk Analysis, the overall probability of spill movements into western Norton Basin or the central Bering Sea would be reduced substantially as well. This alternative provides greater protection to these areas of marine mammal abundance than would Alternative IV. Therefore, it is very unlikely that significant long-term regional effects on marine mammals due to oilspills would occur as a result of this alternative. Due to reduced level of activities associated with this alternative, localized short-term and long-term regional disturbance impacts on marine mammals would also be reduced, especially in inner Norton Sound.

Effect of Additional Mitigating Measures: Effectiveness of mitigating measures, especially those specifically intended to minimize impacts on marine mammals, would be as effective as discussed in Section IV.B.2.d.

Cumulative Effects: The contribution to and potential significance of cumulative effects on marine mammals associated with this alternative would be essentially the same as those of the proposal, although some localized reduction of impact of indeterminant extent may be afforded.

Unavoidable Adverse Effects: Unavoidable adverse effects would be essentially the same as those discussed for the proposal.

e. Impacts on Endangered Species: See Section IV.B.2.e. for a general discussion of potential direct and indirect impacts on endangered species. (Unless otherwise specified, Oilspill Risk Analyses made in this section refer to probabilities conditional on the development of a production field as presumed in Section II.A. and to associated spill contact rates (Samuels and Lanfear, 1981).) Attention is directed to 10-day trajectories of spills greater than 1,000 barrels.

Appendix J, Tables 13 and 14, show that under this alternative there would be an approximate 47- to 49-percent reduction (as compared to the proposal) in risk of spills greater than 1,000 barrels hitting a portion of the Chirikof Basin gray whale feeding area. There would be only a 3-percent chance (Appendix J, Tables 21 and 22) that spills would hit eastern St. Lawrence Island gray whale feeding areas. This is 18- to 26-percent less than would be incurred under the proposal. These fairly substantial reductions in oilspill risks to known important feeding areas of gray whales suggest that probabilities of indirect effects on the species would be reduced as a result of this alternative as compared to the proposal (for Alternatives III, IV, or VI). It is impossible at present to predict the state of all variables which would determine the ultimate significance of such change in vulnerability. However, since the Chirikof Basin feeding area would still be under from 22- to 28-percent risk of contact, it remains possible that such interactions could have localized, short term impacts on gray whale feeding habitat quality or quantity. As for the proposal, direct effects may also occur to the extent that whales could not avoid spilled oil. Appendix J, Table 21, shows that the probability of spills greater than 1,000 barrels moving north toward Cape Wooley and the Bering Strait region is very low--ranging from 0- to 4-percent (segments 24-26) as compared to low to moderate rates estimated for the proposal (0- to 13-percent). Similarly, contact rates for segments 27-29 are 4- to 6-percent for spills greater than 1,000 barrels (Appendix J, Table 21) and considerably less than the 17- to 23-percent that may be demonstrated under the proposal (Appendix J, Table 15). This suggests that movement of spills westward toward bowhead migratory corridors under this alternative is relatively unlikely. Effects on endangered species from noise and disturbance associated with this alternative would probably approximate those incurred under the proposal, although perhaps to a lesser extent since general levels of activity would be lowest. (See Sec. II.A.)

There is little, if any, chance that spills associated with this alternative would encroach upon areas in the immediate vicinity of peregrine nesting habitats such as Sledge Island or Topkok Head (Appendix J, Table 21, 1 percent and less than 0.5 percent chance, segments 23 and 19, respectively). However,

since the proposal poses little risk to these areas, Alternative V is unlikely to afford substantial additional protection to peregrines from direct oilspill effects. As for the proposal, it is unlikely that disturbance of peregrine nesting sites would be incurred, assuming the relevant Information to Lessees is adopted.

Conclusion: Due to a relatively substantial reduction in oilspill risk to known feeding areas of gray whales, indirect effects (e.g., reduction of food resources) associated with Alternative V are much less likely than may be incurred under the proposal, assuming development occurred to the extent estimated herein. In general, it is very unlikely that long-term, regional significant impacts of oilspills on endangered whales would occur as a result of this alternative. However, it is possible that localized, short-term impacts on gray whales may occur since risk to certain areas would still be relatively high. The magnitude of such effects cannot be quantified at this time. As for the proposal, it is possible that endangered whales would be affected detrimentally by disturbance on a short-term, localized basis, especially those species for which little index of tolerance to human activities exist and for which major population segments occur near the proposed leasing area, i.e., bowhead whales.

Effect of Additional Mitigating Measures: The effect of mitigating measure would be essentially the same as discussed in Section IV.B.2.e.

Cumulative Effects: The contribution to and potential significance of cumulative effects on endangered species associated with this alternative would be essentially the same as those of the proposal, although some localized reduction of impacts may be afforded, particularly to gray whale feeding habitats near St. Lawrence Island or in the Chirikov Basin.

Unavoidable Adverse Effects: Although oilspill-related unavoidable adverse impacts may be somewhat reduced as a result of this alternative, other unavoidable adverse impacts on endangered whales would remain essentially the same as described for the proposal. Unavoidable adverse impacts on peregrine falcons are, as for the proposal, likely to be minimal, if existent at all, assuming the Information to Lessees (Information on Bird and Mammal Protection) is adopted.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: This alternative would not have major economic impacts on areas of Alaska outside the Nome census division. Therefore, the general economic impacts which would result in other areas of the state are not discussed in the text of this document. However, possible oilspills could impact the lower and upper Yukon salmon fisheries and other Yukon Delta wildlife resources described in Section III.-D.1. The probability and degree of impact of possible oilspills are discussed in Section IV.A.4.

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): The economic impacts would be important to the Nome area. However, the peak employment impact would be only 29-percent as great as the proposal. Projected employment and population impacts of this alternative are compared

to impacts of the proposal in Table IV.F.3.b.-1. Refer to Section IV.B.3.b., which discusses the proposal, for an explanation of the different categories of employment impact, and for information about economic problems which are expected to accompany OCS development.

Conclusion: See Table IV.F.3.b.-1 for specific employment and population projections. General conclusions are as stated in Section IV.B.3.b. for the proposal.

Effect of Additional Mitigating Measures: Refer to Section IV.B.3.b.

Cumulative Effects: See Section IV.B.3.b.

Unavoidable Adverse Effects: Refer to Section IV.B.3.b.

G. Alternative VI - Southern Deletion (272 Blocks)

This alternative evaluates the deletion of 157 blocks in the southern portion of the proposed sale area. (See Fig. II.B.6.a.-1). The following sections assess the impacts of oil and gas leasing for Alternative VI.

1. Impacts on Social Systems:

a. Impacts on Population: This alternative does not differ appreciably from the proposal in projected onshore population impacts, which, during peak development, are significant. (See the analysis under the proposal, Sec. IV.B.1.a.).

Conclusion: Population impacts are the same as for the proposal.

Effect of Additional Mitigating Measures: This alternative does not differ in its population impacts from the proposal. (See the discussions in Sec. IV.B.1.c. and e., effect of mitigating measures on subsistence and infrastructure.)

Cumulative Effects: Cumulative impacts are the same as the proposal. See the discussion for the proposal.

Unavoidable Adverse Effects: These are the same as those discussed for the proposal, Section IV.B.1.a.

b. Impacts on Sociocultural Systems: Deletion of the southern blocks would reduce impacts on local sociocultural systems in the villages on the Yukon Delta, as well as St. Michael and Stebbins.

Conclusion: This deletion would not reduce sociocultural impacts considerably, since most of the activity would still be centered at Nome or at an enclave near Nome.

Effect of Additional Mitigating Measures: If the proposed Orientation Program measure contained discussions of the present people, their institutions, the function of those institutions and groups, and the effects that contacts by OCS-related employees in the villages could have, then (with increased understanding) the Orientation Program could lessen the impacts. It could not,

Table IV.F.3.b.-1
Comparison of Employment and Population Impacts of Alternative V
To the Impacts of the Proposal

Year	(1)	(2)	(3)	(4)	(5)
	Proposal (No Blocks Deleted)				
	New Jobs Caused Directly & Indirectly by OCS Activities				Population Increase Resulting From OCS Activities (Excluding Commuters)
	Petroleum Jobs Filled By Commuters[1/]	All Jobs Filled By OCS In-Migrants[2/]	Jobs Filled By Persons Who Would Have Been In the Nome Area in the Absence of OCS[3/]	Total New Jobs	
1981	0	0	0	0	0
1982	0	0	0	0	0
1983	664	0	255	919	228
1984	1,408	21	309	1,738	443
1985	2,729	287	352	3,368	1,105
1986	2,385	460	333	3,178	1,617
1987	2,588	800	327	3,715	2,387
1988	2,912	1,110	371	4,393	3,169
1989	1,527	839	376	2,742	2,755
1990	1,077	435	317	1,829	1,676
1991	868	199	304	1,371	998
1992	801	90	310	1,201	693
1993	814	45	315	1,174	571
1994	832	29	320	1,181	533
1995	801	20	324	1,145	510
1996	799	8	329	1,136	484
1997	801	5	329	1,135	432
1998	814	4	330	1,148	429
1999	832	3	334	1,169	431
2000	801	2	334	1,137	428
Year	Alternative V (Deletion of Eastern Blocks)[4/]				
1981	0	0	0	0	0
1982	0	0	0	0	0
1983	209 (31 %)	0	97 (38 %)	306 (33 %)	83 (36 %)
1984	360 (26 %)	0	89 (29 %)	449 (26 %)	105 (24 %)
1985	971 (36 %)	0	215 (61 %)	1,186 (35 %)	254 (23 %)
1986	726 (30 %)	0	211 (63 %)	937 (29 %)	283 (18 %)
1987	1,093 (42 %)	0	196 (60 %)	1,289 (35 %)	275 (12 %)
1988	766 (26 %)	0	288 (78 %)	1,054 (24 %)	425 (13 %)
1989	874 (57 %)	0	280 (74 %)	1,154 (42 %)	368 (13 %)
1990	465 (43 %)	0	249 (79 %)	714 (39 %)	325 (19 %)
1991	443 (51 %)	0	186 (61 %)	629 (46 %)	240 (24 %)
1992	388 (48 %)	0	156 (50 %)	544 (45 %)	204 (29 %)
1993	345 (42 %)	0	146 (46 %)	491 (42 %)	189 (33 %)
1994	285 (34 %)	0	135 (42 %)	420 (36 %)	173 (32 %)
1995	285 (36 %)	0	128 (40 %)	413 (36 %)	164 (32 %)
1996	320 (40 %)	0	132 (40 %)	452 (40 %)	168 (35 %)
1997	345 (43 %)	0	138 (42 %)	483 (43 %)	176 (41 %)
1998	285 (35 %)	0	135 (41 %)	420 (37 %)	172 (40 %)
1999	285 (34 %)	0	128 (38 %)	413 (35 %)	162 (38 %)
2000	285 (36 %)	0	128 (38 %)	413 (36 %)	162 (38 %)

1/ Figures in column 1 refer to oil-related jobs held by commuters (workers recruited from outside the Nome census division, who would fly to residences far removed from the Nome area during periods of rest). While on duty in the Nome area, commuters would be housed in company dormitories either offshore or at a site outside the present limits of the city of Nome. Because these commuters would have a minimal impact on the local economy, they are omitted from projections of population increase shown in column 5. Please note that figures in column 1 represent the number of commuters who would be on duty in the Nome area on any given day. The total number of commuters, including those who on a given day would be residing outside the Nome area during a period of rest, are substantially larger than the figures in column 1.

2/ Figures in column 2 refer to jobs of all types caused directly or indirectly by OCS development, including oil-related jobs and jobs in retail trade and services or in local government, which are filled by persons in the OCS in-migrant category. OCS in-migrants include all persons (except commuters) attracted to the Nome area due to improved employment opportunities resulting from OCS development. These figures include jobs held by workers brought to the Nome area by the oil companies, as long as these workers actually reside in the Nome area (unlike commuters).

3/ Figures in column 3 refer to jobs of all types caused directly or indirectly by OCS development, including oil-related jobs and jobs in retail trade and services or in local government, which are filled by persons who would have been in the Nome area in the absence of OCS development.

4/ Figures in parentheses refer to the impact of Alternative IV as a percentage of the impact of the proposal.

Source: Output of the SCIMP Model of the Institute of Social and Economic Research, University of Alaska, based on petroleum development figures supplied by the Alaska OCS Office. The model also employed certain assumption developed by the Alaska OCS Office, as well as assumptions which are an integral part of the SCIMP Model.

however, totally mitigate them. The cultural resource measure is of prime importance in reducing impacts. Without it, the local and regional impacts would be significantly higher.

Cumulative Effects: The proposed state sale, the Calista Corporation oil and gas leasing; possible tanker traffic from proposed federal sales 83, 85, and 86; port development in Nome; and hard minerals exploration are possible impacting enterprises that could occur during exploration and development under this alternative. This alternative reduces the impacts slightly, especially if the state sale takes place near the Yukon Delta area.

Unavoidable Adverse Effects: This alternative produces unavoidable adverse impacts similar to the proposal. These impacts would be slightly lower for the villages under this alternative.

c. Impacts on Subsistence Patterns: This alternative would delete 157 blocks in the southern portion of the proposed sale area, reducing only slightly the amounts of recoverable oil. The oil resource estimate would be the same as the proposal. Onshore facility siting, as in the mean onshore case discussed under the proposal, would be the case here as well. This alternative would eliminate blocks due west of Stuart Island and extending out beyond the Yukon Delta into the Bering Sea from the present leasing process.

Oilspill Risk: The southern deletion does not change oilspill risk from that of the proposal, since the southern blocks are assumed to be gas prone. (See the analysis for the proposal, Section IV.B.1.c.) If this assumption is altered by an oil discovery in the area, then oilspill risk to the Yukon Delta could be substantially greater, although exact determination of risk is not possible at this time, given the projection of gas in the area.

Onshore Impacts: The southern deletion alternative assumes an onshore development scenario and impacts that are virtually the same as those for the mean case, discussed in detail under the proposal (see Sec. IV.B.1.c.). Impacts on subsistence use would be most severe during the peak period of 1986 to 1991 in which population associated with OCS activities would range from 1,100 to over 3,000 from 1985 to 1989, and down to slightly under 1,000 by 1991. Impacts on subsistence use; fish and game management; and leadership of regional whaling and walrus commissions, as well as subsistence advocacy groups could be significant. (See the discussion under the proposal, Section IV.B.1.c.)

Harvest Pressure and Other Sociocultural Impacts: The effects of cash in the region would be essentially the same as the onshore mean case. Uncontrolled interaction between onshore OCS workers and the local regional population would have many significant and, most likely, both beneficial and negative consequences. From the standpoint of subsistence use of resources, widespread contact would no doubt erode many values and practices which, together, support a way of life that is dear to local residents. Increased cash would provide a wider range and technology to exploit local resources and could increase harvest pressure on local resources, if not contained by fish and game management strategies. The combined effects of competition for fish and game from OCS populations and the internally-based increased harvest pressure resulting from contact with increased cash and an industrially-oriented population with different values could, together, erode some of the current subsistence-based way of life, particularly in the Nome-Cape Nome area. (See the

analysis under the proposal.) Negotiations with industry to limit fish and game harvests by workers could prevent much of this deterioration.

Conclusion: From the standpoint of oilspill risk, this alternative is the same as the proposal, since southern blocks are assumed to be gas prone. Onshore impacts are also virtually the same as the proposal. Harvest pressure and other sociocultural impacts also mirror the proposal. (See Sec. IV.B.1.-c.)

Effect of Additional Mitigating Measures: See the discussion in Section IV.B.1.c. This alternative does not differ significantly from the proposal.

Cumulative Effects: Cumulative effects would be the same. Refer to the discussion of the proposal.

Unavoidable Adverse Effects: These are the same as discussed for the proposal in Section IV.B.1.c.

d. Impacts of Village Livelihood: The population impacts anticipated for this alternative are the same as those for the proposal. (See the discussions under the proposal for village livelihood, population, and subsistence, Secs. IV.B.1.d., a., and c.) For oilspill risk, see the discussion under subsistence for this alternative (Sec. IV.G.1.c.).

Effects on commercial fisheries would particularly affect Yukon Delta communities dependent on the fishing incomes. This deletion reduces the risk to these resources, with corresponding benefits to commercial fishing villages. See also the discussion of Yukon Delta habitat, Section IV.B.2.a.; commercial and subsistence fisheries, Section IV.B.2.b.; birds, Section IV.B.2.c.; marine mammals, Section IV.B.2.d.; and endangered species, Section IV.B.2.e.

Conclusion: Population impacts and associated effects on villages near the Nome onshore base are the same as those discussed in the proposal. (Refer to the discussion under the proposal.)

Oilspill risk on subsistence resources is discussed in Section IV.B.2. Risk to commercial fisheries on the Yukon Delta and near Stuart Island would be reduced by this alternative. See Section IV.B.2.b. (fisheries). Risk to village economies would hinge on the reduction in risk to commercial fisheries, since village cash resources from Unalakleet south, in particular, are heavily dependent on the commercial fisheries of the Yukon Delta.

Effect of Additional Mitigating Measures: See the discussion under the proposal, subsistence and village livelihood, Sections IV.B.1.c. and d.

Cumulative Effects: See the discussion under the proposal, subsistence and village livelihood (Sec. IV.B.1.c. and d.), and subsistence for this alternative (Sec. IV.G.1.c.).

Unavoidable Adverse Effects: These would be the same as for subsistence, Section IV.G.1.c.

e. Impacts on Urban Infrastructure: The deletion of the southern blocks has essentially the identical impact to Nome's infrastructure

as Alternative I (Sec. IV.B.1.e.). The reader is referred to Alternative I for a complete discussion of the impacts.

Conclusion: The effects of this alternative are the same as those described for the proposal (see Sec. IV.E.1.e.).

Effect of Additional Mitigating Measures: The effect of mitigating measures remains as described in Section IV.B.1.e.

Cumulative Effects: The cumulative effects are described in Section IV.B.1.e.

Unavoidable Adverse Effects: Unavoidable adverse effects are described in Section IV.B.1.e.

2. Impacts on Biological Resources:

a. Impacts on Yukon River Delta Habitat: The effects on the Delta would be slightly less with the southern deletion than with the proposal. The deletion of blocks in the southern part of the lease area would slightly decrease the risks of oilspills contacting the Yukon Delta or the Yukon Delta entrainment area by removing potential spill sources in areas close to the Delta (refer to Appendix J, Tables 1, 2, and 3). The overall probabilities of oilspill contact as calculated in the Oilspill Risk Analysis would not change from those of the proposal due to the lack of resource (oil and gas) potential in this area.

Conclusion: Should a large oilspill contact the Delta simultaneously with a storm-surge event, oil could be driven inland onto higher marsh surfaces where it could persist for 5 to 10 years with resultant long-term (chronic) effects on the biota (principally waterfowl and fish) of these marsh habitats. The effects would more likely be local and are not anticipated to result in regional impacts. The intensity of these effects would depend on the size and location of the affected area. The likelihood of such an event is considered very low because of the unusual set of circumstances that would have to occur simultaneously by chance. Additionally, this alternative eliminates potential oilspill sources that pose the greatest threat to the Yukon Delta, further reducing its likelihood of contact by oil.

Effect of Additional Mitigating Measures: The effectiveness of most of the suggested mitigating measures that relate to the Delta should be the same without the southern blocks as with all of the blocks (i.e., the proposal).

Cumulative Effects: The slight benefit to the Delta of the southern deletion would be greatly modified by the plans of the State of Alaska and private groups to lease the areas on or around the Delta. The plans would increase the risks of oilspills, construction activities, and industry personnel influx to the Delta region.

Unavoidable Adverse Effects: The unavoidable effects on the Delta without the southern blocks should be the same as with the proposal (Sec. IV.B.2.a.).

b. Impacts on Fish Resources: The Oilspill Risk Analysis, based on USGS resource estimates, assumes no oil would be found in the southern blocks. Therefore, deletion of the southern blocks from the proposed lease

sale would not alter the impacts on the fishery resources from those discussed in the proposal (refer to Sec. IV.B.2.b.). A minor reduction in ocean space use conflicts between the petroleum and fishing industries would be incurred from the reduction in total area leased.

Conclusion: Impacts on fish resources and commercial fishing activities for this alternative would be the same as the proposal (see Sec. IV.B.2.b.).

Effect of Additional Mitigating Measures: Effects of mitigating measures would be the same as those of the proposal (refer to Sec. IV.B.2.b.).

Cumulative Effects: Cumulative effects would be the same so those of the proposal (refer to Sec. IV.B.2.b.).

Unavoidable Adverse Effects: The unavoidable adverse impacts from this deletion would remain the same as those discussed in the proposal (refer to Sec. IV.B.2.b.).

c. Impacts on Birds: Assuming that only gas is found in the southern part of the lease area, this alternative would have the same risks as the proposal. However, if oil were present in this area, there could be substantial reduction in conditional oilspill risks to the Yukon Delta entrainment area. This deletion eliminates most of the representative spill points (Table 2, pt. 1, 2, 3, and 4, Appendix J) that have moderate to high conditional risks of an oilspill contacting the Yukon Delta entrainment area and contacting the Delta itself (Table 5, land segments 1, 3, 4, and 5).

Human disturbance of nesting birds may only be reduced slightly with this alternative, based on the exploration and development scenarios, with air and boat traffic coming out of the Nome-Cape Nome area. Assuming that only gas is found in the southern part of the lease area, this alternative would have about the same oilspill risks as the proposal. However, if oil were present in the southern blocks, substantial reduction in pollution impacts would be conveyed with this alternative.

Conclusion: Potential oilspill or disturbance interactions with waterfowl and shorebirds on the Yukon Delta could be noticeably reduced with this alternative, although substantial local impacts to birds along the Seward Peninsula are still likely if a major spill occurs. Significant long-term regional impacts are as unlikely as they are for the proposal.

Effect of Additional Mitigating Measures: Refer to the discussion in the proposal, Section IV.B.2.c.

Cumulative Effects: The cumulative effects of this alternative could be reduced slightly from those described in the proposal. However, the degree of impact from other projects could be the same as the proposal.

Unavoidable Adverse Effects: The unavoidable adverse effects described in the proposal may be somewhat reduced with this alternative.

d. Impacts on Marine Mammals: See Section IV.B.2.d. for a general discussion of potential impacts on marine mammals. (Unless otherwise

specified, oilspill contact probabilities referred to in this section assume the occurrence of development to the extent estimated herein (Sec. II.A.) and associated spill rates (Samuels and Lanfear, 1981).) Attention is directed to 10-day trajectories of spills greater than 1,000 barrels of oil.

Comparison of Table 11 to Table 7 and Table 19 to 15, Appendix J, show that oilspill risk associated with this alternative to important offshore areas represented by Mid-boundary targets Nos. 1-4, or segments 28, 30, 32, and 33, is exactly the same as that for the proposal. Obviously, these results are related to oilspill risk model sensitivity to factors other than differences in the pattern of blocks to be leased. According to Samuels and Lanfear (1981), and as shown herein (Sec. II.A.), only gas is assumed present in the southern blocks for purposes of the oilspill risk analysis. Thus, under that projection, since this deletion would not change oilspill rates, spill risk to various targets and land segments are the same as under Alternative I. However, in the unlikely event that oil may actually be present on those blocks, this alternative would reduce spill risks to eastern St. Lawrence Island and Bering Sea marine mammals. As shown in Appendix J, Tables 5 and 7, the blocks from which spilled oil would be very likely to move (in the event of a spill) toward eastern St. Lawrence Island (segment 30), or into important migratory corridors to the southeast of St. Lawrence Island (segment 39), would be deleted.

In general, the overall effects of this alternative due to noise and disturbance (as such noise and disturbance may affect regional marine mammal distribution or productivity) are essentially the same as those of the proposal. Potential localized impacts associated with continued on-ice geophysical or other industrial activity would probably be substantially less under this alternative since blocks which would be frequently covered by shorefast ice and leased under other alternatives (I, III, IV, and V) would not be sold. Therefore, to the extent that shorefast ice in the vicinity of the Yukon Delta is ringed seal habitat (especially ice zones IV and V, Fig. J-1, Appendix J), impacts within that area would be substantially reduced. Since, under the proposal, or Alternatives III, IV, or V, these blocks would be the only location of repeated and continuous human activity in an area of shorefast ice, Alternative VI would be the only one which would reduce such effects. As discussed in Section IV.G.1.c., this alternative may reduce potential impacts on subsistence hunting success.

Conclusion: Direct and indirect impacts of oilspills associated with Alternative VI are very likely to be the same as those for the proposal (Sec. IV.B.-2.d.). However, southwestern-most blocks in the proposal from which spilled oil would be particularly likely to impinge on eastern St. Lawrence Island and adjacent offshore areas would be deleted under this alternative. Impact of noise and disturbance would be essentially the same as that of the proposal, although localized potential effects in ringed seal breeding habitat of shorefast ice would be reduced.

Effect of Additional Mitigating Measures: As discussed for the proposal, effectiveness of the potential Information to Lessees (Bird and Mammal Protection) would be the same. If adopted, the suggested seasonal restriction on drilling would apply to fewer blocks, since many of those identified in the suggested mitigating measures would be deleted.

Cumulative Effects: The contribution to and potential significance of cumulative effects on marine mammals associated with this alternative would be essentially the same as those of the proposal, although some localized reduction of impact of indeterminant extent may be afforded.

Unavoidable Adverse Effects: Unavoidable adverse effects would be essentially the same as those discussed for the proposal.

e. Impacts on Endangered Species: See Section IV.B.2.e. for a general discussion of potential direct and indirect impacts on endangered species. (Unless otherwise specified, oilspill risk analyses made in this section refer to probabilities conditional on the development of a production field, as presumed in Sec. II.A., and to associated spill-contact rates (Samuels and Lanfear, 1981).) Attention is directed to 10-day trajectories of spills greater than 1,000 barrels.

Comparison of Table 7 to Table 11, or Table 15 to Table 19 (Appendix J) shows that this alternative would have the same oilspill associated risk to endangered whales and peregrine falcons as the proposal. Obviously, these results are due to oilspill risk analysis model sensitivity to parameters other than the pattern of blocks leased or hypothetical spill source locations. According to Samuels and Lanfear (1981), and as assumed herein (Sec. II.A.), only gas is present in the southern blocks for purposes of the Oilspill Risk Analysis. Under that projection, since this deletion would not change oilspill rates, spill risk to various targets and land segments is the same as under Alternative I. However, in the unlikely event that oil may actually be present on those blocks, this alternative would reduce spill risks to eastern St. Lawrence Island and Bering Sea endangered whale habitats. As shown in Appendix J, Table 5, the southwestern-most blocks (near locations P1 and P2), from which an oilspill would be likely to move toward eastern St. Lawrence Island, the gray whale feeding habitat, or southwest toward the bowhead wintering areas would be deleted. Thus, it is possible that deletion of Alternative VI as compared to Alternative I, may reduce localized risks, to those habitats in the unlikely situation that oil would be present in southern blocks.

There is little, if any, information suggesting overall disturbance due to noise and other human activities would be different from that projected for the proposal. However, under this alternative, construction of gravel islands would be sharply reduced, thereby reducing potential disturbance of endangered species as may be associated with construction of such islands. Nevertheless, it is still possible that endangered whales could be affected detrimentally by noise and disturbance from other sources, such as site-specific geophysical exploration.

Conclusion: Oilspill and disturbance-related impacts on endangered species would be essentially the same for this alternative as for the proposal, assuming the presumed development and spill rates would, in fact, occur. In the unlikely event that oil may be present on deleted blocks, this alternative would reduce risks of oilspill contact with eastern St. Lawrence Island gray whale habitat and, possibly, those of wintering bowhead whales. Since gravel island construction would be less, disturbance due to that source of impacts would be reduced.

Effect of Additional Mitigating Measures: It is unlikely falcons would be affected by sale-related disturbance associated with this alternative, assuming the suggested Information to Lessees (Bird and Mammal Protection) would be adopted. Effectiveness of mitigating measures would be essentially the same as discussed in Section IV.B.2.e.

Cumulative Effects: Cumulative effects of this alternative would be essentially the same as for the proposal, except perhaps for minor reductions in the overall noise and disturbance. These reductions would be those associated with reduced gravel island construction anticipated under this alternative.

Unavoidable Adverse Impacts: Unavoidable adverse impacts directly associated with this alternative would be essentially the same as those of the proposal.

3. Impacts on Economic Considerations:

a. Impacts on State and Regional Economies: Neither the proposal nor this alternative would have major economic impacts on areas of Alaska outside the Nome census division. Therefore, the general economic impacts on other areas of the state are not discussed in the text of this document. However, possible oilspills could impact the lower and upper Yukon salmon fisheries described in Section III.D.1. The probability and degree of impact of possible oilspills are discussed in Section IV.A.4.

b. Impacts on Local Economy (Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and the Immediate Area): Deletion of the southern blocks would not significantly change the expected economic impacts of OCS development on the Nome census division. See Section IV.B.3.b., which describes economic impacts of the proposal.

Conclusion: See Section IV.B.3.b.

Effect of Additional Mitigating Measures: See Section IV.B.3.b.

Cumulative Effects: Refer to Section IV.B.3.b.

Unavoidable Adverse Effects: See Section IV.B.3.b.

H. Impacts on Other Issues:

1. Impacts on Cultural Resources:

a. Impacts of the Proposal (Alternative I): Without the mitigating measure on cultural resources in place, underwater sites are not protected at the beginning of exploration (see Sec. II.B.1.b.). Increases in population around Nome would increase visits to archaeological and historic sites in that area. Access of Natives to religious sites may be cut off (see American Indian Religious Freedom Act, 1978). Possible pilfering could take place by people unfamiliar with the protection laws regarding these sites. Oiling of archaeological sites in the beach areas is possible, but there are ways of differentiating between carbon dates from oiled material and natural dates. An enclave would help to reduce impacts of exploitation of cultural resources.

Many archaeological and historic sites have a continuous occupation for hunting, fishing, or living in the thousands of years since they were first used. If such a site is disturbed a definite link is made between disturbance of artifact and present social impacts.

Conclusion: If the cultural resource stipulation is not adopted, the impacts would be much higher.

Effect of Additional Mitigating Measures: The impacts of oil exploration and development on cultural resources would be moderate (on a low, moderate, high scale) with the adoption of the mitigating measure on cultural resources. The Orientation Program measure (Sec. II.B.1.c.) provides for information to each person on the project of cultural concerns which relate to the individual's job. The suggested mitigating measure for an orientation program for industry personnel is designed to protect sites from harm. The Orientation Program is formulated by qualified instructors experienced in cultural resources to ensure that industry personnel are informed of archaeological and other cultural resources of the area.

The mitigating measure for protection of Cultural Resources provides for the examination of data from remote sensing surveys, made prior to exploration and development on a leased tract, to be examined by a qualified marine survey archaeologist. If cultural resources indicators are present, they provide for effective measures for protection (see Sec. II.B.1.b.). Reports are to be made to the DCM of the findings and of the actions to protect resources.

With these measures in place (Orientation Program and Cultural Resource Protection), mitigation of impacts would be accomplished, reducing impacts to a low level.

Cumulative Effects: The addition of the Norton Sound exploration population to the population from the proposed state sale, the Calista Corporation leasing, the proposed Chukchi and the Beaufort lease sales, and the mining projects would increase cumulative impacts on cultural resources. This total cumulative impact is expected to be moderate.

Unavoidable Adverse Effects: Damage by public pilfering or wear because of exploration personnel visitation would not be reversible. However, this impact is expected to be slight.

b. Impacts of Alternatives II through VI: The impacts of Alternative II (no sale) would be very low, since there would be no OCS activity in the area. Delaying the proposed sale (Alternative III) would delay the impacts but allow more time for planning, which would lower the impact slightly.

The northern deletion (Alternative IV) would lower impacts to slightly below moderate, since most of the OCS population would still be located near Nome.

The eastern deletion (Alternative V) would reduce impacts for Unalakleet, St. Michael, Stebbins, Shaktoolik, Koyuk, and Elim. With an enclave located near Nome, the reduction in impacts would be low.

Alternative VI (the southern deletion) would reduce impacts slightly on the Yukon Delta if the exploration population is located near Nome.

2. Impacts on Visual, Wilderness, and Recreational Resources:

a. Impacts of the Proposal (Alternative I): Visual impact assessment involves a combination of subjective judgments and methods for identifying and measuring visual impacts. Generally, the extent of visual impact depends upon conditions of visibility, seasonal variations in climate, landscape and solar radiation, the observation point of the viewer, distance to the object viewed, and the viewer's perception of scenic and aesthetic characteristics of the viewshed (BLM, 1978; U.S. Forest Service, 1977). In this EIS, the visual impacts of proposed OCS facilities are evaluated through location, distance, and visibility conditions. A presumption is made that visual impacts may occur in significant viewshed locations in the coastal zone wherein OCS development, both offshore and onshore, constitutes an intrusion on an uninterrupted view. This criterion of visual impact is used in absence of a viewer preference or visual assessment survey.

For the proposed sale area, three major viewshed locations are identified: the Yukon Delta, because of national interest lands classification and the values attached with it; the city of Nome, because of the settlement and its tourism; and the Iditarod National Historic Trail from Nome to Unalakleet on Norton Sound. Given these viewer locations, a visual impact would be likely to occur from the Yukon Delta and from the Cape Nome area. The OCS blocks nearest the Yukon Delta are within viewing distance of the Yukon Delta coastline, and the hypothetical placement of onshore facilities at Cape Nome would be an intrusion upon the historical and recreational character of the Iditarod Trail.

The possibility of significant visual impacts would be mitigated naturally because of poor visibility conditions in Norton Sound. The unaided viewer would not be able to discern offshore OCS structures 55-percent of the time in the summer and 35-percent of the time in the winter (NOAA, 1977). Possible visual impacts at Cape Nome could be mitigated by site planning and design practices applied to the OCS onshore facilities. Refer to the discussion below regarding consultation procedures under the National Historic Preservation Act (NHPA).

Impacts on wilderness values are also difficult to define because of the subjective nature of the wilderness experience. Legislative and administrative definitions of wilderness fix the absence of any human habitation, structures, or manifested alterations to the environs as basic to the wilderness experience (Wilderness Act of 1964, 16 U.S.C. 1131; USDI, 1970; BLM, 1978). No legislatively designated wilderness lands would be directly affected by the leasing proposal in the Norton Sound area. However, OCS operations may affect the wilderness experience of individuals on coastal lands which pose wilderness values in the absence of legislative designation. The northern coastline of Norton Sound and adjacent uplands are not considered to pose wilderness values because of the proximity of existing settlements, established roads, and relics of historical mineral extraction activity. The only part of the Norton Sound coastline which poses values and which could be potentially impacted by OCS development is the Yukon Delta area. The proximity of Native settlements and subsistence harvest activities, as well as boat traffic up the Yukon River,

could disqualify a legislative wilderness designation for the Yukon Delta under provisions of the Wilderness Act of 1964.

Four types of potential OCS impacts of recreation in the Norton Sound region are possible: (1) competing use of recreational facilities in the city of Nome; (2) recreational, hunting, and fishing conflicts between local persons and OCS personnel or OCS-induced population; (3) displacement of lands and sites of recreational and/or park value, or use by OCS development; and (4) OCS interference with tourism and the use of local and regional recreational facilities. The likelihood and magnitude of these types of recreational impacts depend primarily on the location and magnitude of the OCS activities and personnel onshore, together with any regulations and mitigating practices imposed to minimize these impacts.

Very significant impacts on recreational activities and facilities in the city of Nome are expected in the absence of an enclave arrangement and management of OCS onshore personnel, and if the city of Nome is unable to annex the property on which OCS facilities are sited for the purpose of revenue generation. These conditions would result in OCS personnel and their dependents using local facilities which are not designed to accommodate the projected OCS labor force and dependent populations. (Refer to SESP Technical Report No. 53 for documentation of these impacts. BLM, 1980, pp. 211, 231-232, 553.)

In the absence of a specific development proposal for onshore OCS facilities, it is difficult to identify the site-specific impacts to the Iditarod Trail, the Iditarod Race itself, and the historic structures present along the trail. The following types of impacts are possible: (a) interference with or obstructions to the historical and/or commemorative trail route; (b) possible displacement or damage to the Cape Nome Roadhouse, which is on the National Register of Historic Places; and (c) interference with or intrusion upon the recreational and historic character of the Iditarod Trail, the Iditarod Race, and its artifacts through viewshed conflicts and nuisance effects of onshore industrial facilities.

Recreational impacts on the Iditarod Race and the Iditarod National Historic Trail could be mitigated through the following in-place measures providing protection: the National Historic Trails Act (16 USC 1241) and the National Historic Preservation Act (16 USC 470). Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities, summarizes the requirements of these acts. However, these two statutes do not provide specific regulatory authority on non-Federal lands sufficient to avoid or minimize significant adverse effects. Therefore, additional measures are suggested with this EIS. These are discretionary in application by the relevant decisionmakers and managers of lands on which the trail and associated sites are located. (Refer to the Effect of Mitigating Measures below.)

The EIS on the OCS Development and Production Plan is the appropriate forum for evaluating impacts upon and considering mitigating measures for the Iditarod National Historic Trail and sites protected under the NHPA. The preparation of the EIS on the OCS Development and Production Plan and the application of a BLM pipeline right-of-way permit would constitute a federal undertaking for purposes of consultation with the Advisory Council on Historic Preservation. (Refer to Sec. II.B.1.b. of the EIS regarding these requirements functioning as mitigating measures in place.)

Summary: Visual impacts from the offshore structures would be likely to affect areas along the Yukon Delta shoreline. Onshore facilities at Cape Nome may impact viewers on the Iditarod National Historic Trail between Nome and Unalakleet. Poor visibility in Norton Sound and careful site planning and design at Cape Nome could mitigate these impacts.

Impacts on recreational facilities within Nome may be significant if the city is unable to annex property on which OCS facilities are located to generate the necessary revenue to upgrade recreation facilities.

Significant conflict for fish and game resources may also occur. The degree of conflict depends on the location and magnitude of the OCS activities and onshore personnel and the regulations and mitigating measures which are imposed.

Conclusions: Impacts on visual and wilderness resources are minor and short-term, generally spanning only the life of the OCS activity. Significant short-term recreational conflicts may occur locally due to competition for limited local recreational facilities. More regional recreational conflicts are also short-term and would result from competition between Nome and village residents and OCS workers for fish and game resources. The significance of this conflict will vary depending upon the regulations and mitigating measures imposed. No long-term impacts are anticipated.

Effect of Additional Mitigating Measures: The following assumptions accompanying this proposal function as potential mitigating measures: (a) the development of onshore facilities at Cape Nome or between Nome and Cape Nome, (b) the application of an enclave operation through the Alaska Coastal Management Program and planning policies and/or private leaseholder restriction, and (c) the annexation and taxation of onshore OCS facilities by the city of Nome. If these measures are adopted, then the recreational impacts mentioned above, with the exception of impacts on the Iditarod National Historic Trail, associated sites, and the Iditarod Race, could be substantially mitigated if not eliminated. SESP Technical Report No. 53 documents this conclusion with regard to recreational impacts in the city of Nome area alone (BLM, 1980, pp. 211, 231-232, 553).

However, the preceding assumptions on potential mitigating measures are not facts. Thus, the findings on effectiveness of these potential measures could vary as a function of different mitigating assumptions: (a) if onshore facilities are located elsewhere in the Norton Sound area, then impacts on Nome would presumably diminish. However, significant conflicts with recreational pursuits of any contiguous villages are possible. (b) If onshore facilities do not include sufficient on-site recreational facilities, then interaction with Nome recreational and social activities and facilities could cause significant impacts. (c) If the city of Nome is unsuccessful in annexing and taxing the onshore OCS development facilities, then significant impacts on recreational facilities demand could occur because of inadequate revenue sources to finance recreational facility improvements. Thus the proposed mitigating measures have no guaranteed effectiveness, since the authority for these measures is not contained within the DOI. Neither are there explicit statutory or regulatory requirements for these measures. Refer to Section II.B.1.d., Other Mitigating Measures Beyond DOI Authority.

Suggested mitigating measures to protect the Iditarod National Historic Trail, associated sites, and the Iditarod Race itself include the following: (a) The comprehensive plan for the Iditarod National Historic Trail will include recommendations on designation and protection of a commemorative right-of-way, which is expected to implement protection through acquisition of easements and right-of-way agreements. In the Trail's reach between Nome and Cape Nome, approximately, the commemorative trail will follow the existing state highway. From Cape Nome to Elim, most of the Trail segment is on private (Native corporation) land, which will require easements to guarantee protection of the Trail. (b) Protection of the Cape Nome Roadhouse, the Port Safety Roadhouse, and the Solomon Townsite is available through the consultation procedures and mitigation practices required by the Advisory Council on Historic Preservation (36 CFR 800).

The procedures require that any federal undertaking which may affect a site protected under the NHPA to consider and incorporate where feasible site planning and mitigation practices. The possible mitigating practices in the case of onshore OCS industrial facilities for the proposed sale 57 area could include the following: (1) Identification and analysis of alternative sites suitable for the placement of the industrial plant serving OCS development, (2) selection of sites which do not interfere with the Iditarod Trail commemorative route and sites which are protected on the National Register of Historic Places, (3) use of construction practices which avoid or minimize interference with the Trail and the protected sites, and (4) site planning and design to minimize or avoid the visual impact of OCS facilities upon the recreational and historic character of the Trail and the protected sites. Although the NHPA represents a mitigating measure in place, as discussed above, its consultation procedures are merely advisory, and therefore, pose no guarantee of effectiveness in mitigating adverse impacts.

Cumulative Effects: Cumulative adverse effects on wilderness, visual, and recreational values of the Yukon Delta would occur from the proposed State of Alaska oil and gas leasing in territorial waters and Native corporation oil and gas leasing onshore in addition to this proposal. Recreational use in the vicinity of the state highway from Nome to Cape Nome, including its commemorative designation as the Iditarod National Historic Trail, could be cumulatively affected by additional development activity in Nome. Further definition and measurement of these cumulative effects is not possible at this time because of the imprecise nature of the projects identified in Section IV.A.8., together with this proposal.

Unavoidable Adverse Effects: Unavoidable adverse impacts on visual and wilderness resources values may occur if offshore OCS operations are visible from significant onshore and coastal viewpoints. These impacts are condsidered to be unavoidable because no means are available for mitigating the nuisance effect of industrial structures and operations in significant viewsheds.

b. Impacts of Alternatives II through VI: Under Alternative II, no impacts on visual, wilderness, and recreation resources would occur. Under Alternatives III, IV, and VI, impacts on these resources would be substantially the same as under the proposal, Alternative I. The impacts would be substantially the same for Alternatives I, III, IV, and VI because the impact

assessment commonly derives from the same scenario assumptions. Since the scenario assumptions do not change, the impacts should not change.

However, under Alternative V which involves offshore loading, there is estimated to be no significant impact on recreational activities. Visual and wilderness resource impacts could still occur with Alternative V for OCS structures sited within coastal viewsheds of the Yukon Delta.

3. Impacts on Transportation Systems:

a. Impacts of the Proposal (Alternative I): Refer to Section II.B.1.a. for a description of transportation aspects of the exploration, development, and production scenario accompanying this proposal. Also, SESP Technical Report No. 52 regarding transportation systems analysis provides a detailed discussion of the transportation impacts ensuing from the proposal (BLM, 1980). The analyses performed in Technical Report No. 52 is based on three levels (high, medium, and low) of resource discovery. Because of the similarity of resource estimates, the mean case of the proposal corresponds most closely with the low case as analyzed in the Technical Report.

Marine Transportation: Impacts during the exploration phase should be insignificant based on the EIS scenario assumptions. Key assumptions include: (a) OCS-operator use of anchored barges which function as floating warehouses for goods support and storage; (b) use of offshore borrow extraction sites if artificial island platforms are to be employed in shallow waters, and (c) agreements with lightering contractors to supply water, fuel, and other items from the port of Nome.

These assumptions on marine transportation practices reflect available and preferred industry practices for an OCS exploration program in the Norton Sound region. In this respect, the assumptions accompany the proposal. However, DOI has no authority over OCS lessees and their subcontractors to follow these specific practices. Different assumptions reflecting different industry practices could yield impacts on marine transportation systems at the port of Nome. Specifically, if gravel islands are employed as drilling platforms and onshore borrow sources are used, then port facilities would be congested because of the number of barge transits, frequency of loading operations, etc. This situation is unlikely to occur, however, because use of onshore gravel sites and the attendent congestion would be too inefficient.

Marine transportation operations during the development and production phase are comparable to the exploration phase--except with greater volume. The OCS operators would use a combination of workboats, lightering vessels, and barges to move goods between ports of origin to the Norton Sound area, either to the port of Nome or offshore storage areas. From these forwarding points, the goods would then move to the offshore platform and onshore facilities.

During the development and production phase, the EIS scenario assumes that: (a) the port of Nome deepwater terminal would be built with separate berthing space for deep draft vessels, i.e., OCS workboats and barges; and (b) a temporary pipe coating yard for marine pipeline construction would be sited at the Cape Nome facility, along with other OCS onshore facilities.

These assumptions function to mitigate potential impacts on the port of Nome. Since the assumptions are not fixed, the impacts associated with alternative assumptions, namely use of existing port of Nome facilities, are considered. The SESP Technical Report No. 52 documents the impacts to the Port of Nome during initial and peak phases of OCS development in the absence of any deepwater terminal facility before 1987. Briefly, the impacts include: (a) the existing port is not capable of handling OCS traffic; (b) to the extent that existing port facilities are used, impacts on warehousing, berthing, vessel queing for port access, delivery of fuel and water, and goods forwarding would be significant; and (c) local lightering vessel operators would purchase additional vessels to accommodate OCS lightering traffic needs. This would yield a beneficial impact on additional lightering service capability to the Norton Sound communities, but it would also yield an adverse impact of vessel traffic congestion in the existing port of Nome harbor.

In the absence of the Port of Nome deepwater terminal, the OCS operators are assumed to construct such a terminal at Cape Nome which would specifically serve OCS development and production. An alternative assumption regarding the siting of an OCS pipe coating yard is its location at the port of Nome. The port's onshore facilities would have to be expanded to accommodate this use. The Port of Nome Master Plan (Tetra Tech, 1981) includes sufficient acreage for expansion so that OCS use of the port space would not pose any significant impacts, with the exception of facility congestion on the causeway and goods movement logistics.

No marine transportation impacts to other harbors and settlements in Norton Sound and the Yukon Delta are anticipated as a consequence of this proposal. During the peak OCS development period, the frequency of support boat traffic, pipeline barges, etc., could cause localized traffic conflicts with the vessels and small craft offshore of the port of Nome.

Air Transportation: Potential impacts on air transportation systems would only be evidenced in the development and production phase of OCS operations. The volume of air traffic operations during the OCS exploration phase are expected to be insignificant. Air traffic serving OCS development and production includes commercial carriers moving personnel into and out of Nome and contract helicopter services moving personnel and priority goods from Nome to the offshore platforms.

Potential impacts during the development and production phase include increased air passenger movements through the Nome airport terminal and increased aircraft operations at the Nome airport. These impacts could be effectively mitigated by improvements to the airport proposed by the FAA in its 10-year improvements plan (FAA, 1979). See Effect of Mitigating Measures below.

Surface Transportation: During the exploration and development phases, significant impacts on the Nome road work would occur: (a) If onshore borrow extraction areas are to be used, a fleet of heavy construction vehicles (i.e., three axles and above) would deteriorate the existing road work, and (b) the development of the Nome OCS onshore facility would generate significant vehicle traffic between the port of Nome, the Nome airport, and the city itself. The single main route through Nome is hardly suited for this purpose. These impacts can be mitigated; refer to Effect of Mitigating Measures below.

Conclusion: Potential short-term local transportation impacts include vessel traffic congestion, vessel queing for berths, congestion and causeway usage for goods forwarding and storage at the port of Nome, increased air passenger traffic and aircraft operations at the Nome airport, and damages and congestion to surface road network in Nome due to heavy vehicle traffic between the Nome airport and Cape Nome OCS onshore facilities. No long-term or regional impacts are anticipated.

Effect of Additional Mitigating Measures: Several activities function to reduce if not eliminate the impacts on transportation systems identified above. These include: (a) The construction and operation of the Nome deepwater terminal, including separate berths between deepwater and other vessels; (b) installation of improvements to the Nome airport recommended by the FAA in its 10-year plan for Alaskan airport facilities; (c) construction and dedication of a bypass route(s) to the port of Nome and the Nome airport to accommodate heavy vehicle traffic (i.e., three axles and above) from the Cape Nome OCS onshore facilities; and (d) siting of a temporary pipe coating yard at the Cape Nome onshore facility instead of the Nome deepwater terminal.

Additionally, scenario assumptions which mitigate potential impacts on transportation systems should be mentioned: (a) During the period of OCS exploration and/or development, operations before completion and operation of the Nome deepwater terminal, OCS operators would rely on anchored barges as floating warehouses and contract lightering services from the port of Nome for fuel and water; and (b) use of offshore instead of onshore borrow extraction sources if artificial island platforms are to be used by OCS operators.

All of the above are beyond DOI authority as lead agency for this proposal. In this respect, there is no assurance that the above will be adopted. However, subsequent permitting and licensing agencies may incorporate these measures or functional variations thereof to effectively mitigate the above identified potential transportation systems impacts.

The scenario assumptions are considered to be reasonable and preferred industry operating practice, and their voluntary application is considered likely in the absence of governmental regulation. Moreover, the availability of a deepwater terminal, whether installed and operated by the port of Nome or the OCS operators at Cape Nome, is considered to be a necessary prerequisite for OCS field development and production. In this respect, the impacts on the existing port of Nome facility are unlikely.

Cumulative Effects: The only cumulative effects which are reasonably foreseeable upon transportation systems would be the use of the port of Nome deepwater terminal by hard rock mineral development projects, as well as offshore exploratory operations from subsequent state and federal proposed lease sales in the Bering Sea. Refer to Section IV.A.8. for identification of projects which may pose cumulative impacts. The cumulative effects on the port of Nome from these additional developments may not be considered adverse but, instead, could be beneficial. To the extent that port facilities are adequately designed to serve such maritime commerce, revenues to the port authority increase, and the additional port traffic does not interfere with existing traffic operations and derivative commerce, then the impacts from additional port operations would be beneficial.

Unavoidable Adverse Effects: No unavoidable adverse effects on the marine, air, and surface transportation systems are anticipated as a consequence of this proposal. All of the potential impacts are tractable to potential mitigating measures identified above.

b. Impacts of Alternatives II through VI: Under Alternative II, no impacts on transportation systems would occur. Under Alternatives III, IV, and VI, impacts on transportation systems would be substantially the same as under the proposal, Alternative I, since the impact assessment commonly derives from the same scenario assumptions.

However, impacts on marine transportation systems under Alternative V could be greater than those occurring under the proposal. Alternative V assumes an offshore loading scenario with no permanent OCS onshore facilities. Thus, OCS operators would be expected to rely on the port of Nome for goods storage, logistics, and marine transportation functions.

4. Impacts on Coastal Zone Management:

a. Impacts of the Proposal (Alternative I):

Consistency Review with the Alaska Coastal Management Program: Impacts of the proposal on the Alaska Coastal Management Program (ACMP) can be effectively identified and evaluated through the consistency provisions of the Federal Coastal Zone Management Act (CZMA), as amended (16 USC 1456, et seq.). Refer to Alaska OCS Technical Paper No. 4, Legal Mandates and Federal Regulatory Responsibilities, for an explanation of the CZMA consistency provisions as they apply to the OCS leasing program.

Timing of Proposed OCS Sale 57 with Local Coastal Management Plans (CMP's): Figure III.E.4.-1 depicts a timeline for development of the four coastal management plans of interest. The figure also depicts a timeline for exploration and development activities ensuing from the proposed OCS sale 57 scenario. Assuming the schedules for the CMP's and the post-OCS sale operations are accurate, the following findings can be made:

(1) The Nome district CMP should be approved by the Alaska Coastal Policy Council prior to the lease sale. OCS pre-sale consistency determinations, if any, would incorporate any relevant policies of the approved district CMP. However, the Yukon-Kuskokwim (Y-K) Delta, Bethel, and the Bering Strait CMP's are not expected to be completed prior to the proposed sale. In the absence of the approved CMP's, the State of Alaska can comment on the proposed sale 57 Notice of Sale on behalf of the impending plans. The state has commented in the past on the Joint Federal/State Beaufort Sea sale, as well as OCS sale 55 in the absence of an approved CMP for these areas.

(2) Exploration plans are expected to be submitted in the winter of 1982-1983. At that time, the plans would be subject to mandatory consistency reviews pursuant to Section 307(c)(3)(b) of the CZMA. Relevant policies of the approved Nome CMP and the ACMP would be considered by OCS operators in their consistency certifications on exploration plan submittals. Any comments by the Y-K or the Bering Strait CRSA Boards would be forwarded through the State Division of Policy and Development Planning (DPDP) in its consistency review.

(3) The Nome CMP, as well as the Bethel, Y-K, and Bering Strait CMP's, should be completed before review and approval of an OCS Development and Production Plan and EIS submission. In terms of potential significant onshore and coastal impacts, the local programs would be in place. Local government units could participate in the consistency review process for the development/ production plan (Sec. 307(c)(3)(b) of the CZMA).

(4) It should be emphasized that the occurrence of the lease sale itself is not the final governmental decision regarding oil and gas development. Operators in the OCS proposed sale 57 area would have to submit OCS exploration and production plans and obtain various permits and licenses from federal and state agencies. These plans, permits, and licenses would provide further opportunities for the local programs to comment and participate in CZM consistency reviews on OCS development.

(5) The State of Alaska believes that coastal management plans should be complete (or in a stage of near completion) by the time environmental impact statement for the sale 57 proposal is under preparation (State of Alaska, 1979). In this respect, the proposal does not meet the state's position. However, in a more recent position, the State of Alaska recognized that local CMP planning capability can be coordinated with the phasing of OCS operations.

During a pre-sale phase, the state would like to see local planning capability with adequate sources of funding to prepare for post-sale exploration impacts. During the post-sale phase, the state would like to see local capability to actively participate in the review and approval of the exploration plans and associated permits. According to Figure III.E.4.-1 and the above finding, the Nome CMP should have this capability. However, Bethel, the Bering Strait, and the Yukon-Kuskokim Delta CMP's are expected to be adopted after approval of OCS exploration plans in the sale 57 area. All coastal districts should have local planning capabilities prior to the OCS development phase according to finding (3) above.

OCS Onshore Facilities Impacts: The scenario accompanying this proposal indicates that onshore facilities would be sited in the vicinity of Cape Nome. The onshore facilities include petroleum storage, processing, and pumping facilities; gas liquefaction plant; and a marine terminal for transferring oil and LNG products to vessels. The land-use requirements for these amount to 36.4 hectares (90 acres).

The facilities may also include a portable pipe coating yard which would require 12.1 hectares (30 acres) and a support and supply base with a dock which would require 12.1 hectares (30 acres). The pipe coating yard and storage and supply base may not be necessary if operators feel that the deepwater terminal and onshore facility improvements to the port of Nome are suitable for their needs. (Refer to Sec. IV.H.3., Impacts on Transportation Systems.)

The topography of the Cape Nome area is such that the onshore physical plant could not be sited at Cape Nome itself but would be removed to suitable sites either to the west or east. Enough acreage is available so that the commitment of undeveloped private lands to industrial use could be considered insignificant. The lands around Cape Nome have been selected by, and are expected to be conveyed to, the Sitnasuak Corporation (Nome Village Corporation) auth-

orized under the Alaska Native Claims Settlement Act. Additionally, borrow extraction for development of onshore facilities and the marine terminal would not be expected to cause significant land-use impacts because mine tailings and other suitable materials would be available on privately owned lands.

The suitability of the Cape Nome area for OCS onshore facilities cannot be explicitly determined at this time in the context of applicable energy facility siting policies of the ACMP, the Nome CMP, and the Bering Strait CMP. Provisions of the ACMP Energy Facilities Planning Process do not include site-specific land use determinations. (Refer to Appendix B regarding the OCS enclave assumption.)

The Cape Nome location could pose potentially significant impacts to the guidelines and standards of the Alaska Coastal Policy Council (6 AAC 80.010) regarding recreation (6 AAC 80.060); subsistence (6 AAC 80.128); historic, pre-historic, and archaeologic resources (6 AAC 80.150); habitats (6 AAC 80.130); and Areas Meriting Special Attention (AMSA)(6 AAC 80.160). The reasons for the potentially significant impacts are the presence of the Iditarod National Historic Trail and historic sites, numerous cultural artifacts and archaeologic sites in the vicinity of the coastline at Cape Nome, the wetlands and associated biological values present in the Safety Sound area to the east of Cape Nome, offshore subsistence resource harvest in the vicinity of the Cape Nome area, and a proposal by the Alaska Department of Fish and Game to designate the Safety Sound area as an AMSA (Alaska Office of Coastal Management, 1980).

Impacts on the Nome District CMP: The timing of the proposed lease sale is not expected to adversely affect the planning capability of the Nome CMP as recommended by the State of Alaska.

A key issue in assessing impacts of the proposal upon the Nome CMP is the location of OCS onshore facilities and the extent to which support and infrastructure functions are provided by the city of Nome or OCS operators. For purposes of environmental assessment, this EIS assumes that the OCS onshore facilities and support functions would be located at Cape Nome. The EIS also assumes that an enclave planning and operation of such facilities would occur. However, because the authority to implement such an enclave is beyond DOI's statutory responsibility, the impact assessment on the Nome CMP does not assume an enclave. The mitigating effect of the enclave concept is discussed immediately below under Effective of Mitigating Measures.

In the absence of an enclave assumption, the OCS labor force is presumed to seek residence and personal services (i.e., meals, recreation, retail purchases, and use of public facilities) in Nome. This activity would be expected to cause significant impacts upon the city's land use, infrastructure, and certain coastal resources which are the subject of ACMP guidelines and standards of the Alaska Coastal Policy Council. Moreover, a non-enclave arrangement and operation of onshore OCS facilities and personnel could violate the energy-facility siting-process provisions of the ACMP. However, this is not determinate because of a lack of specificity in the ACMP energy facility siting process. Refer to Section IV.B.1. for further discussion of potential socioeconomic impacts in the absence of an enclave concept.

A potential problem to the Nome CMP with regard to OCS onshore facilities and spillover effects is the city's inability to annex significant new territory. Although the resurrected Nome boundaries include the proposed port and industrial development area, Cape Nome and vicinity still remain beyond the city limits. If OCS onshore facilities and the OCS enclave, or other equivalent housing development, are beyond the city's boundaries, then it would experience severe fiscal impacts attributable to spillover service demands within its boundaries. Refer to section IV.B.1.e. of this EIS regarding Nome's urban infrastructure.

Impacts on Bering Strait, Bethel, and Yukon-Kuskokwim CMP's: It is difficult to determine the impacts which the proposal would bear on the Bering Strait, Yukon-Kuskokwim Delta, and Bethel CMP's. In the absence of any approved or even drafted goals and policy statements for the Bering Strait CMP, comparing this proposal's scenario against this program is premature. There remains a possibility of significant adverse effects on this program due to uncertainty.

The Yukon-Kuskokwim Delta and Bethel CMP's would not be directly affected by this proposal's scenario because no onshore facilities are identified within their coastal management boundaries. There is the possibility that operators would seek support facilities and/or onshore development in the Yukon Delta if a commercial hydrocarbon find were made near the Yukon River Delta. However, such potential onshore development is not a part of the scenario accompanying this EIS and is therefore not subject to environmental assessment.

The draft goals statements of the Yukon-Kuskokwim CRSA Board imply potential conflicts with this proposal if certain conditions are realized. If development of OCS hydrocarbons results in damages to the renewable resources of the Y-K CRSA, the physical and natural habitat of these resources, or the subsistence use of these resources, then significant adverse impacts on the Y-K CMP is presumed to occur. However, the Y-K CRSA goals also recognize accommodation of state and national interests which presumably include major energy development. Thus, the Y-K CRSA goals would have to be articulated by subsequent actions to make a clear determination of significant adverse effects from OCS development upon its program.

An oilspill is the most likely source of damage to the renewable resources of the Y-K CRSA, the physical and natural habitat of these resources, or the subsistence use of these resources. The Oilspill Risk Analysis discussed in Section IV.A.4. indicates a low to moderate (0.11) probability of a spill damaging these values within the Y-K CRSA boundaries. For this finding, the following assumptions apply: An oilspill probability of between 0.11 to 0.2 is considered to be moderate, the boundaries of the Y-K CRSA extend to the limit of state territorial waters in the Norton Sound, and "damages" are construed as an oilspill contacting specific renewable resources and habitats on which the Y-K CRSA depends.

Summary: Four coastal districts with Coastal Management Plans (CMP's) may be affected by OCS development: Nome, Bering Strait Coastal Region Service Area (CRSA), Bethel, and Yukon-Kuskokwim CRSA. Given the assumption of onshore development in the Nome vicinity, the CMP's of Nome and the Bering Strait region are critical.

Local CMP's are vital to guiding onshore development related to OCS development and are used as the basis for state concurrence with lessee consistency certifications. Timing the completion of local CMP's is critical for these purposes. In the absence of an approved local coastal management plan, the state bases its consistency concurrence on the Alaska Coastal Management Act and the state guidelines.

Nome's CMP should be completed prior to the lease sale and all coastal districts, but the Bering Strait region should have approved coastal management plans prior to the submission of an OCS Development and Production Plan. The Bering Strait CMP should be available for review prior to the submission of the OCS Development and Production Plan but will probably not be approved by the Coastal Policy Council by that time.

Conclusion: The proposal may adversely affect the Bering Strait CRSA, and possibly the Yukon-Kuskokwim and Bethel CRSA, during the post-sale exploration phase. The Nome, Bethel, and Y-K CMP's are expected to be authorized and have planning capability by the time of OCS development and production. In the absence of approved district CMP programs, this proposal may pose potentially significant, if not severe, local and regional long-term adverse effects on the perceived coastal management values of the Norton Sound region.

Effect of Additional Mitigating Measures: This proposal assumes with the onshore facilities at Cape Nome an enclave facility for housing OCS personnel, support services, and activities related to both offshore and onshore development. Details of the enclave assumptions are identified in Appendix B of this EIS. The following assumptions describe the enclave's role in this EIS: (a) Most of the labor force working temporarily or permanently onshore at the Cape Nome facilities would be housed in special group-housing quarters; (b) the enclave site could include other related sites for contractors servicing OCS offshore operations as well as the onshore facilities; and (c) the plan, design, and operation of the enclave site would be subject to the energy facility policies of the state ACMP, Nome CMP, and/or the Bering Strait CMP. The land-use impacts associated with the enclave facility would be expected to be insignificant. A liberal estimate of the land requirements for a facility sized to accommodate peak onsite labor force would be 100 acres. The undeveloped lands in the vicinity of Cape Nome could clearly absorb this acreage.

The significance of the enclave assumption is its role as a proposed mitigating measure. The enclave functions to mitigate potential adverse impacts upon the city of Nome's infrastructure, housing supply, land use, and social well being. Additionally, the enclave concept functions to mitigate potential impacts around the Cape Nome area, including historical and archaeological resources, habitat values, subsistence harvests, recreational use, and a potential Area Meriting Special Attention Designation under the ACMP.

The specific features of the enclave concept cannot be identified at this time because of various uncertainty factors. The concept could emerge from coastal management planning policies and regulations of the state as well as district CMP's. Apart from coastal management guidance, OCS operators may be required by private leasehold restrictions to use the enclave concept. Alternatively, the enclave concept may be considered a practical necessity by OCS operators because of inadequate existing facilities.

The effectiveness of the enclave concept as a mitigating measure cannot be clearly assessed at this time because of the absence of any clear commitment by relevant authorities and decisionmakers to use this concept. However, this does not mean that the mitigating measure is not effective. As a proposed mitigating measure, the enclave concept could be quite effective in reducing if not eliminating several socioeconomic as well as resource impacts. It is assumed that some form of enclave operation would be applied to OCS field development in the Bering-Norton region because of the practical necessity of doing so. The city of Nome has an incentive to implement some type of enclave arrangement to minimize adverse socioeconomic and coastal management impacts while maximizing any spillover benefits to be captured.

Cumulative Effects: The projects identified in Section IV.A.8. may pose cumulative adverse effects on the coastal zone. However, these cumulative effects are rather conjectural because of the present indefinite and vague nature of the projects. More definitive cumulative effects assessment can be performed later when EIS's on major actions are required.

Unavoidable Adverse Effects: This proposal does not pose any unavoidable adverse impacts on the Alaskan Coastal Zone, or the Nome, Bering Strait, Bethel, and Yukon-Kuskokwim Delta CRSA's. Potentially significant adverse impacts identified in this section are conjectural because of uncertain conditions. Coastal zone management impacts are, per se, tractable by the management practices and mitigating measures.

b. Impacts of Alternatives II through VI: Under Alternative II, no impacts on the coastal zone would occur. Under Alternatives IV and VI, impacts on the coastal zone would be substantially the same as under the proposal, Alternative I, because the impact assessment commonly derives from the same scenario assumptions. Since the scenario assumptions do not change, the impacts should not change.

Scenario assumptions for Alternative III also are identical to those of Alternative I. Impacts may differ, however, because a delay in sale would ensure that the Bering Strait CRSA Plan is approved before OCS development and production plans are submitted. Delay would also ensure that the federal Office of Coastal Zone Management (OCZM) approved the local CMP either as routine program implementation or as an amendment to the ACMP. An approved local program for the Bering Strait CRSA could be critical if an enclave is established at Cape Nome and Nome is unable to annex the area.

Under Alternative V, impacts on coastal zone management should be less than those attributed to the proposal because of the absence of any permanent onshore facilities. However, temporary construction camps, pipe coating yards, etc., could be expected to be sited onshore. These facilities may yield coastal management impacts which would be evaluated in a future EIS on an OCS development and production plan submission.

Conclusion: For most alternatives (I, II, IV, and VI), the impacts on local planning would be comparable. See Section II.H.4.a.

Alternative V would lessen the impacts because no permanent onshore facilities would be constructed. Alternative III provides an opportunity for all local

CMP's to be developed, approved, and implemented. As a result, Alternative III would also have the minimal impact on local coastal management planning.

5. Impacts on Land Use and Land Status:

a. Impacts of the Proposal (Alternative I): Impacts on land status and land-use can be classified as follows: (a) Land requirements for onshore development serving OCS fields, (b) spillover land-use demands and impacts upon settlements associated with onshore facility development, and (c) other indirect nuisance effects upon coastal lands in the vicinity of OCS development. The first and second types of land use impacts are discussed in Section IV.H.4. regarding coastal management impacts. Impacts on residential land use only within the city of Nome are discussed in Section IV.B.1.e. (urban infrastructure). The third type of land use impact refers to interferences with recreational, cultural, and subsistence uses of land as well as potential damages to lands from OCS-related spill incidences. These impacts are discussed in sections IV.H.2., IV.H.1, and IV.B.1.c., respectively.

b. Impacts of Alternatives II through VI: Under Alternative II, no impacts on land status and land use would occur. Under Alternatives III, IV, and VI, impacts on land status and land use would be substantially the same as under the proposal. The impacts would be substantially the same for Alternatives I, III, IV, and VI because the impact assessment commonly derives from the same scenario assumptions. Since the scenario assumptions do not change, the impacts should not change.

Under Alternative V, impacts on land status and land use should be less than those attributed to the proposal because of the absence of any permanent onshore facilities. However, temporary construction camps, pipe coating yards, etc., could be expected to be sited onshore. These facilities could yield temporary land-use and land-status impacts which would be evaluated in a future EIS on an OCS development and production plan submittal.

6. Impacts On Water Quality:

a. Impacts on the Proposal (Alternative I): Environmental impact assessment of drilling fluid disposal upon marine receiving waters has been thoroughly discussed in the appendices to three separate EIS's: FEIS on OCS Sale 65 (BLM, 1978), Final Supplement on the EIS on OCS Sale 42 (BLM, 1979), and the FEIS on the proposed Five-Year OCS Oil and Gas Leasing Schedule (BLM, 1979). Additionally, the FEIS on OCS Sale 60 (BLM, 1981), as well as the DEIS on OCS Sale 46 (BLM, 1980), discuss water quality impacts of previous Alaskan OCS leasing proposals.

OCS exploratory vessels and production platforms will discharge drilling fluids in bulk quantities (approximately 590 metric tons of drilling muds and 560 metric tons of cuttings would be discharged per exploratory well), along with lower level releases of petroleum hydrocarbons and sanitary wastes from waste-water discharge sources. Additionally, OCS production platforms will be discharging bulk quantities of petroleum formation waters. If gravel islands are used as drilling platforms during the exploration or development phases, a considerable volume of suspended sediments would be entrained in waters adjacent to the island construction area. Similarly, pipelaying would yield sediment suspension in the water column.

The above types of water-quality impacts are considered to be insignificant. Several factors contribute to this finding:

(a) Drilling fluid and formation water releases quickly become non-toxic in marine receiving waters with moderate depth and circulation. Moreover, rig monitoring studies have shown that the toxic contaminants in drilling fluids and formation waters typically dilute to background concentrations of marine receiving waters within a few hundred meters of the discharge source.

(b) Discharges of all types of contaminants from offshore OCS exploration and production operations are the subject of the National Pollution Discharge Elimination System (NPDES) permitting program mandated under the Clean Water Act. Under this program, EPA establishes discharge limitations for various waste water contaminants that will not interfere with beneficial uses of marine receiving waters. Refer to Alaska OCS Technical Paper No. 4 for further discussion of EPA's Clean Water Act responsibilities with regard to OCS water pollution sources.

(c) OCS construction operations yielding sediment loading and resuspension in receiving waters of Norton Sound are minor in volume and import in comparison to natural processes affecting the Sound. Specifically, the annual volume of sediments entering the Sound from the Yukon River (70-90 million metric tons/yr) and other drainages are enormous. Also, storm surges and oceanographic conditions in the Sound result in significant bottom scouring, mass deposition, and wasting (Larsen, Nelson, and Thor, 1980) which far exceed the impacts of anthropogenic sedimentary loading in the Sound.

Minor impacts from OCS sediment deposition and resuspension include some smothering of benthic species located in the vicinity of the offshore construction operations. The dredge and fill permitting requirements of the Corps of Engineers (COE) under Section 404 of the Clean Water Act will apply to such OCS operations so that mitigating practices will be in place to minimize the impacts on marine receiving waters.

Conclusion: Significant impacts on water quality are very unlikely for this proposed action.

Effect of Additional Mitigating Measures: No suggested mitigating measures apply to reduction of water quality impacts. The applicable regulations derive from federal and state non-discretionary statutory requirements.

Cumulative Effects: Cumulative effects on water quality may be observed from additional development projects in the Norton Sound region. Oil and gas leasing in the territorial waters of Norton Sound would yield waste-water discharges. Hard rock mineral development and placer mining operations would yield surface runoff, sediment loading, and waste water discharges. It is difficult to judge the significance of these additional impacts in the absence of site-specific information on the volume of effluent loading, the contaminants being discharged, and the mixing characteristics of the receiving waters. Cumulative water-quality impacts from subsequent development proposals can be evaluated in future EIS's on major actions.

Unavoidable Adverse Effects: No unavoidable adverse effects on water quality are anticipated from the proposed action because the impacts are tractable to mitigation.

b. Impacts of Alternatives II through VI: Under Alternative II, no impacts on water quality would occur. Under Alternatives III-VI, the impacts would be substantially the same as under the proposal, Alternative I. Water quality impacts are not differentiated for alternatives because the impacts are site-specific with the location of OCS operations. Thus, block deletion options do not effectively change the nature of the water quality impacts associated with the specific alternative. Significant impacts are very unlikely.

7. Impacts on Air Quality:

a. Impacts of the Proposal (Alternative I): Impacts on air quality ensuing from the proposal are expected to be insignificant. This finding of no significant impact on air quality refers to all alternatives to the proposal, with the exception of Alternative II, no sale. Air quality impacts ensuing from this proposal are expected to be analogous to those identified in the EIS's on OCS sales 46 and 60 for the following reasons: (a) Air quality assessment on proposed OCS sales in Alaska is based on pristine, ambient, air quality conditions; (b) the air quality assessment of offshore emission sources is based upon emissions inventory and pollutant trajectories from individual exploratory vessels or production platforms; (c) the onshore air pollutant levels from individual offshore emissions sources is estimated to be insignificant as shown in the DEIS on proposed sale 46 and the EIS on sale 60; and (d) onshore emission sources in frontier OCS development areas are expected to be no greater than existing ambient concentrations in the Kenai-Nikiski area where petroleum production, refining, gas liquefaction, and marine loading operations occur. No violations of any national or state air quality standards or U.S. EPA Prevention of Significant Deterioration requirements are anticipated.

This finding of no significant impact on air quality assumes the application of mitigating measures in place. These mitigating measures include the statutory responsibilities of EPA regarding onshore emission sources and USGS regulations regarding offshore OCS emission sources. Refer to Alaska OCS Technical Paper No. 4 for a description of the relevant air-pollution-control authorities of EPA and USGS.

Conclusion: It is very unlikely that state or federal air quality criteria would be exceeded; therefore, it is very unlikely that significant degradation of air quality would occur.

Effect of Additional Mitigating Measures: No suggested mitigating measures apply to reduction of air quality impacts. The applicable regulations derive from federal and state non-discretionary statutory requirements.

Cumulative Effects: Cumulative effects on air quality may be observed from additional development projects in the Norton Sound region. Any hard rock mineral development which involves movement of ore products through the port of Nome terminal may increase the levels of particulate emissions. Also, hydrocarbon drilling operations in territorial waters of the Norton Sound or

onshore on Calista Corporation lands may yield increased ambient pollutant concentrations in particular locations. However, these emissions are not expected to violate any ambient standards or applicable PSD increments.

Unavoidable Adverse Effects: No unavoidable adverse effects on air quality are anticipated from the proposed action because the impacts are tractable to mitigation.

b. Impacts of Alternative II through IV: Under Alternative II, no impacts on air quality would occur. Under Alternatives III through VI, the impacts would be substantially the same as under the proposal, Alternative I. Air quality impacts are not differential across alternatives because the impacts are site-specific with the location of OCS operations. Thus, block deletion options do not effectively change the nature of the air-quality impacts associated with the specific alternative. It is very unlikely that significant degradation of air quality would occur.

I. Relationship Between Local Short-Term Uses and Maintenance and Enhancement of Long-Term Productivity

In this section, the short-term effects and uses of various components of the environment of the Norton Sound area are related to long-term effects and the maintenance and enhancement of long-term productivity. The effects of the proposed action would vary in kind, intensity, and duration, beginning with preparatory activities (seismic data collection and exploration drilling) of oil and gas development and ending when natural environmental balances might be restored.

In general, short-term refers to the useful lifetime of the proposal, but some even shorter-term uses and effects are considered. Long-term refers to that time beyond the lifetime of the proposal. The producing life of the field development in the lower Norton Sound area has been estimated to be about 20 years for oil and 32 years for gas. In other words, short-term refers to the total duration of oil and gas exploration and production, whereas long-term refers to an indefinite period beyond the termination of oil and gas production. This period will vary from one environmental component to another.

Many of the impacts discussed in Section IV are considered to be short-term (being greatest during the construction, exploration, and early production phases), which could be further reduced by the mitigating measures discussed in Section II.B.1. Additional measures that could be initiated by the state and local communities that would significantly reduce economic inflation and social impacts include rent controls discussed in Section IV.B.3.b. and the enclave assumptions discussed throughout the Section IV assessment and detailed in Appendix B.

Biological productivity would be lost in the short-term on all onshore lands used in the proposed project. With proper management, these areas could be returned to productivity in the long-term. Restoration may not be entirely feasible; however, the overall loss would be a minor adverse effect. The direct land requirements, as shown in the hypothetical development scenario, would show in both the short-term and the long-term because of disturbance. Major construction projects near the Yukon Delta would cause definite changes

in both the short-term and long-term. Some species may have difficulty repopulating and could be displaced.

Short-term oil pollution and the possibility of long-term, cumulative oil-pollution impacts could cause serious adverse effects on all components of the marine ecosystem, including fisheries. While restoration would allow fisheries production to regain original levels, any reduced annual harvests during the life of the project would be irretrievably lost. The extent is not known presently, but the potential must be recognized.

Freshwater pollution from onshore activities is a short-term effect. The long-term decrease in water quality may be considered to be a tradeoff for obtaining oil and gas resources.

The biota would be threatended in the short-term by potential oil pollution. Direct mortality could be significant through the combined effects of harassment by humans and the increased volume and frequency of noise from vessel traffic or overflying aircraft. In the long-term, such disturbances could alter behavior patterns and could drive fauna away from traditional feeding and breeding grounds or to other critical areas within their range, reducing species populations over a long period of time.

Habitat destruction could cause a reduction in subsistence species, such as salmon, which could threaten the regional economy. The improved accessibility to primitive areas from increased construction is a short-term result of this proposal. This overall wilderness value of the coast may decrease from increased land use. Increased human populations in the short term could change the regional Native culture in the long-term. The subsistence way of life could be modified and population shifts could occur. The overall changes cannot be termed positive or negative, except by those affected.

Archaeologic and historic values discovered during development would enhance long-term knowledge. Overall, finds may help to locate other sites, but destruction of artifacts would represent long-term losses.

Consumption of offshore oil and gas would be a long-term use of non-renewable resources. Economic, political, and social benefits may accrue from the availability of oil and gas. Most benefits would be short-term and would decrease the nation's dependency on oil imports. If additional supplies were discovered and developed, the proposed production system would enhance extraction.

The production of oil and gas from the Norton Sound area would provide short-term, critically needed energy and would perhaps provide time either for the development of long-term alternative energy sources or substitutes for petroleum feedstocks. Petroleum development in these areas may mean the irreplaceable loss of some fisheries production. The maintenance and enhancement of long-term productivity would depend on efforts to control water-quality levels. Regional planning would aid in controlling changing economics and populations and, thus, in moderating any adverse impacts.

As explained in the preceding impact sections, alternatives to the proposal, such as cancellation, delay, and partial deletion options, reduce to varying

degrees both the long- and short-term environmental effects as well as the long- and short-term energy supply benefits.

J. Irreversible and Irretrievable Commitment of Resources

1. Minerals Resources: The mean resource estimates of the proposed action are 480 MMbbls of oil and 2.01 tcf of natural gas. If these resources are discovered, they would be irretrievably consumed.

2. Social Systems: Lifestyle elements in Nome could be lost if full-scale development of OCS oil and gas resources occurs, as under the proposal, in the Nome-Cape Nome area and if enclave or modified enclave conditions are not maintained. If this occurs, the social, political, and economic structure of Nome would be fundamentally changed, after a period of transitional boom-town growth and deterioration in the quality of life locally. Irretrievable loss of customary and traditional renewable resources could significantly damage the social and economic fabric of village life in villages adjacent to the Nome-Cape Nome staging area, if access to fish and game was unrestricted, while significant growth of local human populations occurred with full development.

Lack of consideration by incoming OCS populations for traditional Eskimo culture and lifestyle may mean irretrievable loss of behavior patterns and their associated material products. The production of baskets, amulets, face masks, and certain subsistence tools are the result of traditional behavior patterns. These are examples of culture that could be lost through loss of traditional behavior patterns. Other irretrievable material products of past cultures such as archaeological remains may be lost through looting of sites and indiscriminate or accidental trespassing (or activity) on known and unknown sites. The orientation program and cultural resource measures (Sec. II.B.1.b. and c.) protect against most, but not all, such losses.

Increased housing costs and inflated living expenses would cause Nome residents to spend greater percentages of expendable income on basic necessities, thereby foregoing the possibilities of a higher quality of life. The cost to the city of Nome to provide basic services in a high-growth situation would prevent the city from expending those resources on improved services.

3. Biological Resources: Commercial fishery losses may occur in several ways as discussed in Section IV.B.2.b. (Impacts on Fish Resources). For example, if the nearshore areas are contaminated, salmon, herring, and king crab may avoid the areas in which salmon and herring are harvested. Any losses of commercial fishing incomes attributable to this proposal would be irreversible and irretrievable. Unharvested commercial finfish and shellfish, as renewable resources, would be irretrievably lost to the economy.

General industry activities, such as increased ship traffic, aircraft noise, and land-based activities, could displace marine and terrestrial birds and mammals into less favorable environments, which would eventually result in reduced population levels. This displacement could become irretrievable if permanent alterations to the environment and habitat were maintained by man.

4. Endangered Species: Under the proposal, it is possible that endangered whales could be subjected to irreversible direct and indirect

effects of oilspills, disturbance due to noise and other human activities, or losses and/or deterioration of habitat due to facility developments. Whether such effects would lead to permanent (irreversible) losses of whale resources is unknown (see Sec. IV.B.2.e., Impacts on Endangered Species).

5. Economic: The only commitment that could be considered possibly irreversible and irretrievable would be the economic risk, resulting from OCS activity, of destruction of fisheries resources or destruction of other fauna and flora used for subsistence by area residents.

V

REVIEW AND ANALYSIS

OF

COMMENTS RECEIVED

V. REVIEW AND ANALYSIS OF COMMENTS RECEIVED

Comments and testimony were received from a diverse group of individuals, groups, organizations, companies, and local, state, and federal agencies. Comments ranged from support of the statement and the proposal to requests for major revisions of the statement and postponement or withdrawal of the proposal.

Appendix L contains copies of correspondence received from federal agencies, state and local governments and agencies, and other representative organizations and individuals that represented the major concerns regarding the draft statement and the proposed action. A listing of persons testifying at the public hearing and a listing of those persons who submitted written comments are also included in the latter portion of this section.

All written and oral comments on the DEIS were reviewed in order to determine necessary corrections and editorial changes or issues. Where possible and appropriate, the DEIS has been revised to correct errors and omissions and to clarify or augment discussions of issues of concern. All substantive issues were analyzed to determine which revisions were necessary to strengthen and improve the DEIS. The FEIS reflects, wherever possible, the consideration given to these issues.

The following pages summarize the issues of major concern that were raised during the DEIS review process. For convenience, they have been grouped in the following manner:

A. Mitigating Measures
B. Approach, Assumptions, and Methods Used
    1. Design of alternatives and development scenarios
    2. Oilspill risk and analysis
    3. Environmental studies and data gaps
C. Environmental Impact Assessment
    1. Physical considerations
    2. Social systems
    3. Biological resources
    4. Economic considerations
    5. Coastal zone management
    6. Water quality
D. General Issues
E. Public Hearings and Comments

A. Mitigating Measures

1. Potential Mitigating Measure for Orientation Program:

Issue: The proposed Orientation Program measure will not adequately mitigate potential impacts to environmental, social, and cultural values.

Sources: Sohio Alaska Petroleum Company, Friends of the Earth, Association of Village Council Presidents (AVCP), David Marshall, Dan Thomas, and Kawerak, Inc.

Response: This measure has been used in several Alaskan sale areas, including the Beaufort Sea joint sale area and the Cook Inlet lease area. Although the content of the two programs has varied, their format has been consistent with local concerns and has included characteristics of the area, and consultation with industry. It is DOI's experience that the program has been informative, successful, and useful in guiding personnel behavior and creating an understanding between oil workers and native communities. It also alerts personnel new to the region about important environmental resources the government seeks to protect. The lessees are required to develop an orientation program which helps to make leasing operations compatible with a sensitive environment of people and resources.

2. Potential Mitigating Measure for Transportation of Hydrocarbon Products:

Issue: The Transportation of Hydrocarbon Products measure is inadequate as written and should be reworded to ensure the free passage of migratory animals and to prohibit long, continuous causeways.

Sources: David Marshall, Kawerak, Inc, Friends of the Earth, AVCP, and Nunam Kitlutsisti.

Response: The intent of this measure is to ensure transportation of hydrocarbons by the environmentally preferable and safest method.

An exposed pipeline may at times be an obstruction to the movement of some mobile benthic animals. However, the effect of this impediment may be alleviated, at least in part, when measures are undertaken to safeguard the pipeline from the forces which might move or damage it. Burial of the pipeline is one of the protective techniques; others include covering the pipeline with concrete or placing it in a tunnel that extends from the shore to a safe depth. Also, local currents which erode depressions beneath the pipeline or deposit material around it produce temporary migratory routes.

As required by 30 CFR 250.34, the lessee must submit a Development and Production Plan to the Deputy Conservation Manager, Offshore Field Operations for approval. If pipelines are used, a description of their location, design, and safety measures must be included. Rights-of-way for pipelines are subject to environmental safety assurance through regulations requiring the use of the best available and safest technologies, OCS Lands Act, Section 4(e) and, if applicable, that the action complies with local coastal zone management programs, Coastal Zone Management Act of 1972, Section 307.

It is not anticipated that long causeways will be constructed as part of any oil and gas transportation scenario; over 90 percent of the tracts in the proposed lease sale area are located in waters deeper than 10 meters (33 ft) and the distances to land ranges from 16 to 100 kilometers (10-62 mi). In addition, the construction of a causeway would require a permit from the U.S. Army Corps of Engineers. This permitting process is subject to public review. Construction of the causeway must also comply with existing coastal zone management programs, the Endangered Species Act, the Marine Mammal Protection Act, and other state and federal laws and regulations designed to protect migratory animals and their habitat.

Issue: The EIS needs to indicate blocks where pipelines should be buried in order to minimize the risk of ice gouging.

Source: State of Alaska.

Response: Ice gouging is a potential problem to the production phase of OCS development in this area. Site-specific determinations concerning the potential for ice gouging and the need for pipeline burial will be made prior to approval of development and production plans. According to: (1) 30 CFR 250.34 which requires that the lessee submit a Development and Production Plan to the Deputy Conservation Manager, Offshore Field Operations for approval or modification; these plans must include (a) if pipelines are used, a description of their location, design, and safety features, (b) current interpretations of relevant geological information, and (c) a description of environmental safeguards; (2) maps showing where ice gouging has been observed are available from the U.S. Geological Survey in Open File Reports; ice gouging is a random event which produces transitory surfical features; and (3) pipeline experience in the Arctic marine environment is very limited, but 30 CFR 250.18(a)(3) and (b)(4), in addition to the OCS Lands Act, require that the Best Available and Safest Technologies (BAST) be used for all oil and gas production facilities attached to the seafloor as well as the pipelines that carry the oil and gas. The EIS has identified areas of major ice gouging activity. The application of this data to specific tracts will be determined at the time of submission of a development plan.

3. Potential Mitigating Measure for Seasonal Protection of Marine Mammals From Effects of Oilspills During Peak Migration Periods:

Issue: The measure for seasonal protection of marine mammals migration should be extended to the entire lease area.

Sources: Friends of the Earth, State of Alaska, AVCP, Natural Resources Defense Council (NRDC), Matthew Iya.

Response: There is a relatively high probability that a spill in the proposed lease area would move into offshore areas of the northern Bering Sea and potentially impact large numbers of marine mammals in that region. The possibility of applying this measure to the entire area was evaluated, but it was determined that it was unnecessary and that long-term benefits would most likely be achieved only for the tracts identified. It is less likely that toxic or unweathered oil would reach migratory corridors from blocks not listed. If this measure were adopted, it would apply to drilling on the specified blocks from any structure, whether drill rig or gravel island, during all phases of exploratory operations. See also the discussion of the following issue.

Issue: The proposed mitigating measure for seasonal protection of migrating marine mammals is not needed or justified by the available evidence.

Sources: Exxon Company U.S.A, Sohio Alaska Petroleum Company, ARCO Exploration Company, Texaco Inc., Alaska Oil and Gas Association (AOGA).

Response: Large numbers of walrus, beluga whales, and bearded, ringed, and spotted seals seasonally pass through or near the sale area. These mammals would be particularly vulnerable if spills occurred on the blocks indicated.

Spills will potentially expose large numbers of animals to contact with oil in a relatively short period of time. One comment used the apparent undisturbed gray whale migration through the Santa Barbara spill as evidence that marine mammals in general will not be directly affected by contact with spilled oil. Such evidence has no direct application to projected impacts on immature or adult seals and walrus. Available data clearly indicate that seals and walrus, especially immature animals, could very likely be adversely affected by oil contact. Even if oiled animals would not show behavioral effects, the possibility remains that absorption of hydrocarbon and sublethel physiological effects can accrue for contacted walrus or seals. In terms of numbers of migrant walrus and seals at risk in the proposed sale area this potentiality alone should be considered a significant concern for short- or long-term physiology, health, and status of their populations.

It was stated in comments that in coastal hauling areas, certain phocid seals were at low risk and this contradicted the stated need for a seasonal drilling restriction. However, large numbers and a high diversity of marine mammals move through this offshore area in association with sea ice and do not necessarily haul out at coastal sites. The potential measure was drafted to minimize the probabilty of spill interaction with the migratory seals and walrus in offshore areas, as well as at certain walrus hauling areas.

Regarding the point that a seasonal restriction and operation measure is not justified by available evidence, especially in regard to gray whales, the effectiveness of this stipulation was evaluated specifically for endangered species. It notes that the seasonal restriction would have limited benefit to gray whales. Many gray whales are present due north of St. Lawrence Island near the proposed sale area throughout the summer, and the seasonal restriction would not reduce their vulnerability during summer months. Close comparison of that evaluation to the one submitted in relation to nonendangered marine mammals (Sec. IV.B.2.d.) shows that the primary justification for the seasonal drilling measure is to protect the large populations of seals and walrus--not gray whales--passing through the areas of concern at specific seasons. This measure would, however, assure that the probability of spills during important seasons is as low as possible (e.g., equal to or close to zero) to avoid potential effects detailed in the DEIS. If spills occur during such conditions, there could be widespread oiling of major portions of migrant marine mammal populations.

Although effects are of a low probability, this measure could reduce the risk of spills rapidly interacting with major populations of migrant marine mammals.

4. Potential Mitigating Measure for Area of Special Concern:

Issue: The proposed mitigating measure for the area of special concern should also address blowouts, rig fires, and pipeline breaks.

Source: Friends of the Earth, State of Alaska, Kawerak, Inc., AVCP, Nunam Kitlutsisti, David Marshall, and Dan Thomas.

Response: While the possibility exists that these events (well blowouts, rig fires, and pipeline breaks) could occur, a stipulation to require extra precautions to prevent them is not warranted. Mitigation of these types of impact-causing events is already in effect by regulatory requirements which

call for the use of "Best Available and Safest Technologies" (BAST) when conducting offshore oil and gas operations. Further, consistent with the above regulatory requirements, all Alaska OCS Operating Orders are currently being developed by the U.S. Geological Survey. These operating orders will detail a variety of requirements including provisions for drilling operations (which include the use of blowout-prevention equipment), production safety systems (which require the use of BAST), and pollution prevention and control platforms and structures (which include a program for verifying structural integrity of OCS platforms), and oil and gas pipelines. Therefore, a stipulation required to provide "extra precautions" would be duplicative and unnecessary.

Issue: The proposed mitigating measure for the area of special concern should be changed to allow the USGS to decide on procedures.

Source: AOGA.

Response: This proposed mitigating measure was changed to allow separation, treatment, storage, and piping of produced oil if the DCM finds that such activities can be safely accomplished (see Sec. II.B.1.c.).

Issue: The proposed mitigating measure for the area of special concern is unnecessary and should not be adopted.

Sources: Exxon Company, USA, ARCO Exploration Company, AOGA.

Response: The safety of the standard operating procedures is included in the USGS oilspill statistics which show that loading in the vicinity of the Yukon River Delta presents a definite risk to the delta. As stated in the last paragraph under Evaluation of Effectiveness (page 17 of the DEIS), the stipulation is designed so that it is not excessively restrictive relative to the benefits. It becomes more restrictive only if oil is discovered near the Yukon River Delta (gas is not covered by the measure).

Issue: The discussion of the area of special concern presented in the EIS (Secs. III.C.1. and IV.B.2.a.) is contradictory to the discussion in Appendix K.

Source: State of Alaska.

Response: The information in Appendix K was requested from the industry oilspill cooperatives; it was provided to BLM as a service and should be considered as a statement of the industry's viewpoint. The assumptions and predicted success of the cleanup scenarios in Appendix K have not been demonstrated in Norton Sound.

Issue: The St. Lawrence Island region should be included in the Area of Special Concern.

Sources: Friends of the Earth, AVCP, Kawerak, Inc., and Nunam Kitlutsisti.

Response: In determining which blocks to include in the potential measure for the Area of Special Concern, the entire lease area was analyzed. It was felt that the Yukon Delta is the most sensitive because of high concentrations of bird and fish resources and the oilspill vulnerability of the habitat. Since St. Lawrence Island is not within close proximity to the proposed lease blocks, it is therefore less vulnerable. Protection of St. Lawrence Island is considered in the seasonal stipulation on exploratory drilling for the western blocks.

5. Potential Information to Lessees on Bird and Mammal Protection:

Issue: The potential Information to Lessees on bird and mammal protection is inadequate and should be a stipulation.

Sources: Friends of the Earth; AVCP; Kawerak, Inc.; Nunam Kitlutsisti; and David Marshall.

Response: The Department of Interior does not have regulatory authority over flight patterns of aircraft. The measure is designed to inform bidders of other restrictions that they may have to comply with, and to describe generally, the parameters of what may be considered harassment. BLM supplies maps to USGS which identify critical areas.

Issue: The potential Information to Lessees on bird and mammal protection should include information from a recent Fish and Game report.

Source: State of Alaska.

Response: The report entitled Recommendations for Minimizing the Impacts of Hydrocarbon Development on the Fish and Wildlife, And Aquatic Plant Resources of the Northern Bering Sea and Norton Sound became available after publication of the DEIS. EIS authors have reviewed the document and have incorporated information from this report, where applicable, into the FEIS.

6. Potential Information to Lessee on Subsistence Activities:

Issue: Information to Lessee on subsistence and wildlife concentrations would be improved by addition of information on seasonality of wildlife concentrations and timing of subsistence harvests.

Source: State of Alaska.

Response: Appropriate tables and graphics from this EIS will be made available to the lessees.

Issue: The potential information to lessees on subsistence activities should be a stipulation.

Sources: Friends of the Earth; AVCP; Kawerak, Inc.; Nunam Kitlutsisti; and David Marshall

Response: Our analysis indicates this measure does not need to be a stipulation. The seasonal protection of marine mammals stipulation, the Information to Lessees on birds and mammal protection, and other mitigating measures,

could adequately protect subsistence activities in the lease area and either directly or indirectly protect subsistence use of the biological resources. Through coordination with the State of Alaska's fish and game management authorities and in conjunction with the environmental training program, industry personnel are made aware of critical subsistence use areas, seasons of use, and types of activities to expect and respectfully avoid.

Operations relating to oil and gas exploration and production are reviewed at the time exploration and development plans are submitted. At those times, activities could be rerouted by the DCM or timing changed to avoid disruption to subsistence activities.

* * * * * *

Several additional mitigating measures were suggested for inclusion in the FEIS. The following is a discussion of the suggested measures.

Issue: Test structures should be required in the proposed lease sale area to ensure industry capability.

Sources: AVCP, Friends of the Earth, Nunam Kitlutsisti, Paul Abraham, Sonny Joseph, Allen Soosuk, John Pullock, Phil Holt, Helga Eakon, Robert Okitkun, Raphael J. Murrian, and John Kelly.

Response: A measure to require test structures in the Norton Sound area was evaluated during preparation of this EIS, but it was determined that such a requirement was not necessary. This evaluation was based on (1) the actual operating experience of the petroleum industry with various platform types in a variety of marine environments including the Beaufort Sea and Cook Inlet; (2) the guidelines for the design of offshore structures as set by the American Bureau of Shipping, Lloyds Register of Shipping, and Det Norske Veritas; and (3) the applicable legal requirements including the Platform Verification Program.

Issue: A standby rig along with cleanup equipment and trained personnel should be on site when drilling commences.

Source: AVCP, NRDC, Friends of the Earth, Nunam Kitlutsisti, and Paul Abraham.

Response: During the exploratory, development, and production phases, the numbers and types of drilling rigs in the Norton Sound area will vary. Any of these rigs could be used for drilling a relief well in the event of an uncontrolled blowout. Rig availability, the historical drilling record, advances in technology, geological factors, operating and training procedures, phase of development, and oilspill cleanup technology can be evaluated in reviewing the application for the drilling permits. At that time, the adequacy of the exploration, development, and production plans will be determined.

Issue: Subsistence losses resulting from an oilspill should receive compensation.

Sources: David Marshall, NRDC, and Weaver Ivanoff.

Response: The Alaska Department of Fish and Game is responsible for management of local fish and game populations, except for certain species under the jurisdiction of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Since "subsistence uses" are presently given priority in both state and federal actions in the area, it would allow for substitutions based on subsistence priority. If damage occurs, claims can be asserted under Title III of the OCSLAA (the Offshore Pollution Fund), 43 U.S.C. 1813.

Claims for economic loss arising out of oil pollution may be asserted for injury to or destruction of property or natural resources, loss of income resulting from injury to or destruction of property or natural resources, and loss of use of property or natural resources. Any U.S. resident may present a claim to the fund for loss of profits or impaired earning capacity due to injury to, or destruction of, real or personal property or natural resources. This includes subsistence users of natural resources, except that compensation is not allowed to the extent that reasonable alternatives to the affected activities are available but not utilized. In order to claim compensation for loss of income, a person must show he or she derives at least 25 percent of annual earnings from activities which use the property or natural resources. Compensation is limited to the reduction or loss of earnings or profits suffered, but is not allowed for lost employment or business when appropriate substitute employment is available but not undertaken. A claim may be made by the federal government for loss of natural resources over which it exercises sovereign rights or exclusive management authority, or by a state for natural resources within the boundary of the state, belonging to, managed by, controlled by, or appertaining to a state. Compensation received will be available for the cost of restoring, rehabilitating, or acquiring the equivalent of the natural resource. Federal, state, and local governments may also assert claims for lost tax revenues. The Attorney General may assert a claim on behalf of a group of U.S. residents who would be more adequately represented as a class in asserting their claims or any member of the group may maintain a class action to recover damages on behalf of that group.

Issue: A Norton Sound Biological Task Force should be established.

Sources: Friends of the Earth, AVCP, and Sohio Alaska Petroleum Company.

Response: The possibility of establishing a Biological Task Force was discussed during DEIS preparation. It was analyzed and determined that the existing intergovernmental coordination procedures provide an adequate mechanism for exchange of information.

Issue: Lessees should be required to hire local residents.

Sources: Weaver Ivanoff, and the Bering Straits Coastal Resource Service Area (CRSA) Board.

Response: The Department of the Interior does not have the authority to require lessees to hire local residents. In fact, state "local hire" laws have been held to be unconstitutional by the Supreme Court. Local communities may coordinate with industry to arrange for training and hiring of local residents.

Issue: A mitigating measure should be added to prohibit the discharge of drilling mud and formation waters in waters less than 10-meters deep, to protect benthic communities and higher trophic levels.

Sources: Friends of the Earth, AVCP, NRDC, and State of Alaska.

Response: While it is agreed that the discharge of drilling mud and formation waters would depress benthic communities in relatively shallow waters beneath and adjacent to individual drilling operations, it is judged that a stipulation to prohibit this discharge in waters less than 10 meters deep is not warranted. This judgment is based on an analysis which concludes a relatively low potential for disturbance. Additionally, the U.S. Environmental Protection Agency already regulates such discharges through the issuance of National Pollutant Discharge Elimination Systems (NPDES) permits as authorized by Section 402 of the Federal Water Pollution Control Act.

This concern of benthic community response and food web interaction was analyzed by (1) calculating the total possible area (sea bottom) of disturbance, (2) comparing the volume of mud discharge with that which occurs naturally, and (3) examining the composition and fate of toxic constituents in drilling muds.

It was calculated that approximately 300 hectares of sea bottom could be disturbed by these discharges. This calculation was determined by assuming a possible disturbed area of 500 meters in diameter for each well drilled (which exceeds that which is reported in the literature for both formation waters and muds) and by estimating the number of wells projected for that portion of the proposed lease area within the 10-meter isobath (16 wells). This represents approximately 0.4 percent of the total lease area with water depths less than 10 meters and less than 0.05 percent of the area in this depth range from Stuart Island to the South Mouth of the Yukon River. Further, when it is considered that the area of disturbance would most likely be elliptical instead of circular and that several wells may be drilled from the same platform, the total amount of disturbance would probably be less than 300 hectares.

The anticipated discharge of mud and cuttings from a well drilled to 2,956 meters (average depth estimated for this field) has been estimated at 1,200 metric tons (500 yd^3) (Charles Wilson, USGS, personnal communication, 1981). Therefore, over the 10-year drilling period, 18,500 metric tons would be discharged from the 16 wells estimated to be drilled in waters under 10 meters deep.

This figure is very insignificant when compared to the 700 to 900 million metric tons of sediments which the Yukon River has discharged into this region over the same period. Consequently, it is concluded that this large natural discharge of sediment would mask any adverse effect from increased turbidity or smothering of benthic fauna that could occur as a result of drilling mud discharge. The concern over heavy metal contamination could also be allayed by this phenomenon. The more toxic ionic species of these elements in seawater would be "scavenged" by the abundant suspended particulate load. Thus potential uptake by planktonic and benthic organisms would be significantly reduced.

While lab studies have demonstrated that certain components of drilling muds and formation waters are toxic to marine organisms, field efforts have shown these effects to extend only in close proximity to the discharge point (see Sec. IV.H.6). Based on the low number of discharge sources anticipated for the area of concern, it is concluded that these discharges would have very insignificant impacts from a regional viewpoint. The area of concern (shallow waters off the Yukon Delta) contains the lowest diversity and biomass of benthic fauna in Norton Sound (Feder and Jewett, 1978).

Issue: There should be a stipulation requiring lessees to consult affected Native corporations and associations during development and implementation of the orientation stipulations

Sources: The Bering Straits CRSA Board.

Response: Local communities are normally consulted and assist in formulating a mutually satisfactory orientation program. (See the response to comments for potential orientation program measure.) They are notified of availability of exploration and development plans. Accordingly, it has been determined that such a requirement by DOI is neither necessary nor appropriate.

Issue: The measures discussed in the DEIS which could mitigate visual, wilderness, and recreational impacts should be clarified or deleted.

Source: Exxon.

Response: This measure is explained in Section II.B.1.d. of the EIS. It is beyond the authority of the DOI and is presented as information to local residents in order to make them aware of some additional controls which may be exercised to mitigate potential visual, wilderness, and recreational impacts.

Issue: Mitigating measures were not specifically indicated for potential geohazards such as faults, thermogenic gas seep sites, current scouring, and liquefaction.

Source: AVCP.

Response: Geohazards as described in Section III.A.1 can be located by surveys required by USGS under operating order No. 2 and the characteristics can be determined through investigations. This ensures selection of proper drilling sites and structures designed to withstand the maximum forces. In addition, a discussion of the environmental hazards during the Norton Sound Synthesis meeting concluded that technology that will permit engineering design for these concerns either exists or will be available within 5 years. (Table III.A.1.-1.)

B. Approach, Assumptions and Methods Used

1. Design of Alternatives and Developmental Scenarios:

Issue: Facilities should be located in a noncritical habitat.

Source: NRDC.

Response: Facility siting is subject to all existing laws and regulations, including the Endangered Species Act. Facility siting will fall within the authority of the Nome CMP.

However, unless the area is annexed by Nome, its control will rest with the State of Alaska through the Bering Strait Coastal Resource Service Area Board.

It is therefore conceivable that local planning will dictate an enclave, of sorts, at the Cape Nome site rather than trying to integrate OCS development activities within the city of Nome. Cape Nome is close enough to Nome to allow use of the Nome airport to ferry workers to an enclave located away from Nome. It was also felt that the Cape Nome area, apart from the superior physical attributes, is biologically far less critical than other parts of the sound--particularly those areas of the bay which are characterized by shallow water; marshlands; and large, seasonal avian populations.

Issue: The deletion of blocks within 12 miles of the Yukon Delta needs to be analyzed.

Source: State of Alaska

Response: This deletion option and its impacts have been fully evaluated through Alternative VI, the southern deletion (see Sec. IV.G.).

Issue: The assumption that supply, support, and storage bases will be built around Cape Nome fails to consider the potential for oil and gas leasing on state tidelands at the mouth of the Yukon River, on federal uplands in the Yukon Delta National Wildlife Range, and on Native corporation lands in the Yukon Delta area.

Source: AVCP, Friends of the Earth, and Nunam Kitlutsisti.

Response: The petroleum development scenarios developed for this EIS are a product of the most relevant information which the analysts have gathered from the best sources available. They represent a hypothesis of what we consider likely to happen given the information that is available at the present time. Refer to Section II.B.1 and Technical Paper 1 (Tremont, 1981).

We recognize that a major hydrocarbon find in the Yukon Delta region could change the potential pattern of any Norton Sound oil field development. However, it is not possible at present to assess the aggregate impacts of proposed OCS lease sale 57 and the potential state sale since there are no resource estimates available for the proposed state sale and no decision has been made regarding the location of tracts that may be contained in the final state offering. The state of Alaska will prepare an environmental assessment which will analyze the potential for developmental impacts in the Yukon Delta region.

Future EIS's prepared on oil and gas activities in the Norton Sound region will assess the cumulative impacts of any hydrocarbon activities which may be more definitively planned for the Yukon Delta region at that time.

Issue: A western deletion altenative should be analyzed which would offer only those tracts currently identified for deletion in Alternative V.

Source: NOAA.

Response: According to NOAA, this option has an oil resource estimate of 390 million barrels which is based on the differences in resources estimated for Alternative V and the proposal. This resource estimation assumes the structures are uniformly distributed along the deletion boundary.

A western tract deletion as suggested by NOAA would not greatly reduce oilspill risk to western Norton Sound. Conditional probabilities (assuming that a spill has occurred at a specific launch point) in Appendix J indicate that oilspills which occur in the eastern portion of the proposed sale area would tend to travel westward. Greatest conditional risks to St. Lawrence Island are from hypothesized spill points P5 (15-percent chance of contact within 10 days of a spill) and P11 (20 percent) in the eastern tracts and from P19 (30 percent) and P20 (15 percent) along the tanker route (Table J-5). A western tract deletion would not greatly reduce risk of spilled oil reaching the Bering Sea icepack. This can be evaluated by combining conditional probabilities of oilspills reaching any of oilspill-model border segments 25 through 34 (see Fig. IV.A.4.c.-2 and Table J-5). Spills originating within the proposed deletion would reach the Bering Sea border 48 percent of the time, on the average, within 10 days. Oilspills originating elsewhere in Norton Sound average a 43-percent chance of reaching the Bering Sea border in the same time frame, only slightly less.

Note also that because of the continued likelihood of transportation spills in the western Norton Sound, a western tract deletion would reduce the predicted number of 1,000 barrel or greater spills within the western portion of the sound from 1.5 to 0.9. This deletion alternative would reduce the predicted spill rate for the entire sound by about 19 percent, to 2.3 spills.

Maps showing the density of ice gouging indicate that more of the tracts in the eastern section of the NOAA proposal may be subject to ice gouging than are tracts in the western section. However, pipelines can be buried and covered to protect them from ice gouging.

Infrastructure and resource development time frames should not significantly vary from that of the proposal. Total resources should only decline by 20 percent from the proposed action. Transportation impacts should be substantially the same as the proposal.

A western deletion alternative would not significantly differ in its impacts on subsistence patterns or village livelihood systems. Population impacts and associated onshore development are projected at 92 percent of the proposal, which would not appreciably change the magnitude of impacts discussed under the proposal, Section IV.B.1.c. and d. Oilspill risk to marine resources would be reduced slightly by this alternative, but tanker associated oilspill risk would still put Bering Strait villages and Nome area villages at greater risk than villages east or south in the lease sale area. The amount of resources would still be associated, no doubt, with an onshore develoment scenario, which is discussed and analyzed in the proposal analysis.

With a western deletion long-term infrastructure impacts remain virtually unchanged. Reduced impacts during peak years, however, may help to mitigate strains on detention facilities, schools, health facilities, and their attendenting specialists. Housing shortages will be reduced but will continue to be critical. One advantage of reducing peak year needs but not long-term needs is the reduction of long-term surpluses in facilities and specialists.

Although peak year requirements will be reduced with the proposed western deletion, they shall place a major burden on local planning. As a result impacts to coastal management and local land-use planning remain the same as for the proposal. Impacts to the Nome Census Division determined by interpolation of MAP and Alternative IV, are similar to these of the poposal.

IMPACTS IN THE NOME CENSUS DIVISION

	Peak Impact (1988)	Average Long-term Impact (1990-2000)
Total Employment Impacts (including jobs held by nonresident workers who would commute to other regions of Alaska or out of state during frequent rest periods) . . .	3,514	1,177
(Percent of original proposal impacts)	(80%)	(95%)
Resident Population Impacts . . .	2,345	601
(Percent of original proposal impacts)	(74%)	(92%)

Oilspill risks to the Yukon River Delta resulting from the proposal are considered unlikely and significant regional impacts to fish resources of Norton Sound are not anticipated. An analysis of oilspill probabilities from spill points located in the area proposed for deletion by NOAA (western deletion) demonstrates no significant reduction in the already low risks to the Yukon Delta or fish resources of Norton Sound from those of the proposal. Leasing only the eastern blocks would not appreciably change the impacts for these resources.

Potential oilspill impacts on marine mammals including impacts on endangered cetaceans and impacts on marine and coastal bird habitats in western Norton Basin could be reduced somewhat by the suggested western tract deletion alternative as indicated in Appendix J (Tables 1, 2, and 3; spill points P13, P14, P15, targets Mid band 4 winter season and seabird foraging area 2 winter season). However, oilspill risks to marine mammal and bird habitats and populations along the eastern coast of St. Lawrence Island and endangered gray whale feeding habitat north of St. Lawrence Island would still be at comparatively high oilspill risk from tanker traffic coming from Cape Nome if development and production of oil occurs in the eastern tracts (Appendix J, Tables 1, 2, 3; spill points 17, 19, and 20).

A western tract deletion would omit tracts where ice hazards are the highest and where potential drilling platform oilspills would pose a comparatively high chance of interaction with marine mammals migrating through western

Norton Basin. However, the proposed seasonal exploratory drilling restriction on the southwesterly tracts for the protection of marine mammals during peak migration periods (see Sec. II.B.1.c., Potential Mitigating Measures) should minimize exploration oilspill risks and potential disturbance of marine mammals on the western tracts if they are not deleted.

It is concluded from the above analysis that a western deletion alternative would not significantly differ in its projected impacts from those of the proposal.

Issue: Tracts which pose a threat to the Yukon Delta should be deleted.

Source: NRDC.

Response: The tracts which pose the greatest potential risk to the Yukon Delta are those which are closest in proximity to the Delta. The potential impacts these tracts pose to the Delta habitat were the basis for the formulation of Alternative VI in the early planning stages of the EIS. The reduction in the potential impacts by the deletion of these tracts are analyzed in Section IV.A.4. (Oilspill Risk Analysis), and Section IV.G. (Impacts on Social Systems, Biological Resources, and economic considerations). In addition, if the proposed lease sale were held, including the southern blocks, a suggested lease stipulation has been recommended for inclusion entitled "Area of Special Concern" (Sec. II.B.1.c.). This measure is intended to reduce potential risks to the Yukon River Delta area by restricting loading of produced oil from those tracts nearest the Delta.

Issue: All tracts which pose a threat to any zones of major bird and animal concentrations should be deleted.

Source: NRDC.

Response: All zones of major bird and animal concentrations are outside the boundaries of the proposed lease sale. The primary zone of marine birds and animals near the proposed sale area is the Yukon River Delta. Discussion of the potential for impacts for major bird and mammal concentrations can be found in Sections IV.A.4., IV.B.2.g., and IV.G. These analyses seem to show deletion will make little difference in protection to zones of major bird and animal concentrations. The Secretary's final decision on which blocks to include will be made at the time of the notice of sale.

Issue: Tracts which threaten Safety Lagoon and Golovin Bay should be deleted.

Source: NRDC.

Response: The tracts which pose the greatest potential risk to Safety Lagoon and Golovin Bay are those tracts which are closest in proximity to these important habitats. An alternative to delete these tracts from the proposal is analyzed as Alternative IV. These discussions are presented in Sections IV.A.4. (Oilspill Risk Analysis) and Sections IV.E. and H. (Impacts on Social Systems, Biological Resources, and Economic Considerations).

Issue: The EIS does not adequately explain the assumption that no potential oil resources exist within the southern blocks of the proposal.

Source: AVCP, Friends of the Earth, and Nunam Kitlutsisti.

Response: Using the known geophysical data, the best estimate of the U.S. Geological Survey is that these blocks have no commercial quantities of oil. This factor was taken into account when developing the scenarios and assumptions used in this document. The Department of Interior will prepare a developmental EIS at least once in each frontier area if commercial quantities are found to be present. This assumption will be reexamined as more precise geophysical information becomes available during site-specific surveys and exploratory drilling. The impact analyses in Section IV account for the possibility that oil may be present and discovered in the southern blocks.

Issue: The significance of the proposed construction of the Point Conception, California liquefied natural gas (LNG) plant to the Norton Sound sale was not discussed.

Source: Federal Energy Regulatory Commission.

Response: The location and nature of the future Point Conception facility were considered, but no significant relationships were identified with the proposed sale in Norton Sound.

Issue: The EIS assumption that the average depth of exploratory wells would probably be greater than 6,500 feet, is incorrect.

Source: AOGA

Response: Based on the U.S. Geological Survey's interpretation of the nature of the potential resorvoirs, the well depths may average 6,500 feet for the production phase of OCS activities and 9,700 feet for the exploratory phase.

Issue: The resource development time frames assumed in the EIS are unrealistic.

Source: Texaco, Inc., AOGA, Sohio Alaska Petroleum Inc., and ARCO Exploration Company.

Response: The developmental time frames provided by the Geological Survey are incorporated in each of our environmental statements. The Geological Survey is aware of and considering industry criticisms regarding their developmental time frames and is in the process of some revision.

Issue: The actual construction of undersea oil pipelines should not be attempted until adequate research is performed.

Source: Bureau of Indian Affairs.

Response: Before any pipeline is permitted or constructed (assuming the discovery of hydrocarbons) two significant environmental assessment processes will be accomplished. First, since the Norton Sound is a frontier area for hydrocarbon explorations, the discovery of commercial quantities of hydro-

carbons may result in the preparation of what is termed a "developmental EIS." This "developmental EIS" will be written with a better knowledge as to the amount and location of the resources. At that time we will have a better idea as to where potential facilities may be located and what the potential path of the pipelines may be. Second, as part of the field development process, any trunk pipeline right-of-way must be cleared through the BLM/OCS Office. This clearance process will require a full environmental assessment of the potential impact a pipeline might have on the environment. Additionally, prior to pipeline construction, there is an extensive permitting process conducted by other federal agencies, particularly the Department of Transportation. A full analysis of the necessary technology and the related environmental impacts will take place at that time.

Issue: The possible transportation impacts for the Yukon River Delta area should have been considered in the DEIS.

Source: Calista Corporation and Friends of the Earth.

Response: Analysis of several issues led to the selection of Nome-Cape Nome as the focal point for our infrastructure analysis and the rejection of other areas such as the Yukon Delta. The economic analysis of the resources of the proposed action, performed by consultants to the Alaska OCS Office, indicated that they were not of a sufficient volume to justify the construction of a lengthy overland pipeline. Therefore, a scenario was developed which assumed that the resources of the proposed sale would be transported to market via oil and LNG tankers. Sites adjacent to the sale area were analyzed in order to identify those areas which would provide physical characteristics most favorable to the establishment of an OCS support base and a deepwater oil and/or LNG terminal. Of those sites studied, only the Nome-Cape Nome region appeared to offer the required combination of infrastructure, dry stable land, and deep nearshore anchorages sufficient to accommodate a marine transportation scenario (refer to Technical Paper 1). After analysis, no transportation impacts to the Yukon Delta are anticipated with the Nome-Cape Nome assumption (see Sec. IV.H.3.a.).

By contrast, the Yukon Delta is completely without infrastructure, almost entirely marshland, and surrounded by water depths which are prohibitive to all but the most shallow draft vessels. Marine support facilities in the Delta would have to be constructed on "dryer" land up river from the mouth and could be subject to annual flooding caused by ice jams at the mouth of the Delta. The location of a production facility on the Delta would require production to piped inland to process and then pumped 25 to 30 miles back out to sea to reach a point where water depths would allow tankers to rendezvous with a loading bouy. Apart from these considerations, it is of interest to note that beyond the shorefast ice zone, which surrounds the Yukon Delta and where water depths gradually reach a point which would allow tankers to operate, lies a zone of very active ice movement. This zone features ice build up and formation of pressure ridges. This would complicate the task of offshore loading hydrocarbons near the Yukon Delta. Therefore, the Yukon Delta is a less appropriate site for oil and gas operations than other points, particularly around Nome and Cape Nome. Therefore, it is believed that the Yukon Delta would be used as a support base only if onshore exploration would take place.

Issue: The EIS should clarify the pipeline standards that would be required during the production and development stages.

Source: City of Teller.

Response: The responsibility for enforcing design safety for any trunk pipeline built in the Norton Sound will fall under the authority of the Materials Transportation Bureau of the U.S. Department of Transportation.

In 1976, a memorandum of understanding regarding pipeline safety regulations was signed by the Secretaries of Interior and Transportation. This memorandum specifies each agency's responsibilities and identifies the Materials Transportation Bureau as that government agency charged with the enforcement of design, construction, operation, and maintenance regulations for pipeline safety (see FEIS on the North Atlantic OCS Lease Sale No. 42, Vol. 4, or contact the Alaska OCS Office).

Issue: Alaska OCS Office could have benefited from better engineering expertise in developing their infrastructure scenarios.

Source: ARCO Exploration Company.

Response: The Alaska OCS Office relies upon the technical expertise of the engineers and geologists of the U.S. Geological Survey, as well as that of Dames and Moore petroleum technology consultants. In addition to these sources, we routinely request written and verbal comments from the petroleum industry relative to the development of plausible petroleum infrastructure and transportation scenarios. In response to a request in regard to Norton Sound ARCO Alaska, Inc., provided information on potential support and supply bases, potential drilling structures, potential site locations for onshore processing and transhipment facilities, and transportation strategies for hydrocarbons as well as the potential offshore processing and loading scenario. The information was very useful, and it was incorporated as an integral part of the infrastructure scenario.

Issue: The capabilities of industry to build and maintain gravel islands in the proposed sale area were understated.

Sources: AOGA, Zapata Corporation, Rowan Drilling, and Sohio Alaska Petroleum Company.

Response: We recognize from discussions with industry and a review of the current literature that current technology exists for building artificial islands at certain water depths. During summer/fall these islands could easily be built in the more shallow at certain water depths in portions of the Norton Sound. However, the offshore scenario discussed within the EIS called for the offshore loading of hydrocarbons during all seasons. As the offshore loading of hydrocarbons during periods of ice has as of yet not occurred in any producing field, it is believed that such a technology if it is used in the Norton Sound will be among the pioneer efforts of its type. Such a situation would require careful engineering analysis and planning.

Issue: Golovin Bay should have been discussed as a potential support base.

Source: State of Alaska.

Response: Neither Golovin Bay nor any other site was discussed within the EIS as a potential support base due to the superior facilities and location of the city of Nome. The city's future causeway dock should enhance water depths adequate to berth OCS support ships, while the proximity of the Nome airport and availability of storage adjacent to the Nome dock would greatly enhance the rapid movement of any logistics effort. Unlike the city of Nome, the Golovin Bay area does not have the infrastructure necessary to support a large OCS exploratory effort.

2. Oilspill Risk and Analysis:

Issue: Oilspill risk analysis for land segments along the Yukon Delta should show a more consistent pattern of vulnerability to potential oilspills.

Source: AVCP, State of Alaska, and NOAA.

Response: The low-risk land segments on the Yukon Delta (Table 15 in Appendix J and Fig. IV.A.4.c.-2) all have a spill contact probability of 1 percent. The USGS oilspill risk model rounds off all percentages to integers. Thus, no risk segments include the range of 0-0.49 percent and low risk segments involved the range of 0.5 to 1.49 percent. A difference of one percentage point in oilspill risk should not be considered meaningful.

Risk to land segments in the Yukon Delta is low because 1) trajectories of hypothesized oilspills tend to travel away from the Delta due to the combined wind and current fields (see Leendertse and Liu, 1981) and 2) the portion of the proposed lease area nearest the Delta is not thought by USGS to contain any oil; therefore, the spill launch points nearest the Delta have no probability of a spill.

Issue: The oilspill trajectory model overemphasizes the movement of free-floating oil and underestimates the significance of ice associated oil.

Sources: Marine Mammal Commission, AVCP, and Friends of the Earth.

Response: The conditions under which spilled oil will move with the ice rather than underlying water are described in Section III.A.2.d. of the EIS. The movement of oil under ice conditions is considered and included in the trajectory analysis.

The adaption of the trajectory model to Norton Sound ice conditions is further documented in Leendertse and Liu (June 1981). The model calculates that in Norton Sound in the presence of ice, spilled oil would move with the ice rather than underlying water 99 percent of the time. Model calculations of presence and movement of ice and entrained oil include consideration of the 18-year ice record, percent ice cover, ice thickness (calculated from degree days and percent ice cover), wind stress on the ice, water stress beneath (including tides), Coriolis effect, internal stress, and sea surface tilt.

Issue: Reliability and verification of the Rand model of circulation used in the oilspill risk analysis is incomplete.

Sources: AVCP, Whale Center, Marine Mammal Commission, David Marshall, State Representative Anthony Vaska, and Rural CAP.

Response: The Rand model for the eastern Bering Sea was adapted for use in Norton Sound. This model is based on well-understood physical oceanographic relationships between tidal and wind-driven currents. It is well-documented (Liu and Nelson, 1977; Liu and Leendertse, 1978, 1979, and 1981; Leendertse and Liu, 1978) and is being cited by the scientific community (Pearson et al., 1981). The adaptation of the model to Norton Sound is discussed in Leendertse and Liu (June 1981) and was very recently presented at the Port and Ocean Engineering Under Arctic Conditions meeting in Quebec City, Canada.

The results of the model for Norton Sound are consistent with patterns of observed currents and ice movements in Norton Sound. It correctly predicts amphidromes (points of minimum tidal amplitude) in the Norton Sound area. The model also correctly deduces the known baoclinis current toward the northwest near Nome. Modeled ice movement has been verified by comparison with observed ice floe movement by in sites measurements in Norton Sound and by satellite photographs.

Models such as the Rand model allow analysis of greater amounts of tidal, current, winds and other weather data in a more consistent and quantitative manner than would otherwise be possible. The model is a tool that summarizes this data. For example, it can be calculated with the model that under ice cover, an oilspill in Norton Sound will almost always move with the overlying ice rather than underlying water. Much of the available oceanographic data for Norton Sound has been incorporated in this manner. The wind data in the model is based on the 19-year weather record at Nome. A statistical comparison of this record with available central Norton Sound data was used to correct for small, consistent differences in wind speed and direction between Norton Sound and Nome. A statistical sample of this "corrected" 19-year wind record was used to model forty 30-day weather and wind patterns. Note that a single average wind was not used nor was the wind data base limited to the relatively short period of OCS sponsored studies.

Issue: The potential oilspill risk to the King Island area needs a more detailed explanation.

Source: King Island Native Corporation.

Response: King Island is very unlikely to be affected by an oilspill occurring in the Norton Sound proposed lease area. It lies outside the boundaries of the oilspill trajectory model. Winter currents and winds would tend to move any spilled oil to the southwest, away from King Island. In summer, currents, and winds, could move oil toward King Island, but the time and distance of transport would allow significant weathering and dispersion. Because of the small size of King Island and because of the low probability of oilspills, contacting the model boundary segments between King Island and Norton Sound (see Fig. IV.A.4.c.2), it is very unlikely that King Island or its wildlife would be contacted by an oilspill from OCS activities in Norton Sound.

Issue: The spill rate should be based on experience from oil and gas activities in upper Cook Inlet.

Sources: AOGA, ARCO Exploration Company, Chevron USA, Inc., and Exxon Co., USA.

Response: The U.S. Geological Survey historical spill data base used in the oilspill risk analysis incorporates oil drilling activity on the entire outer continental shelf of the United States. The experience is broad and the data is reliable. This is still a small sample with respect to the number of spills and the volume of oil handled internationally. For platform spills, there are only nine spills of greater than 1,000 barrels on record for the period of 1964 to 1979. The most recent spill occurred in the Gulf of Mexico on November 23, 1979. Of the nine platform spills, five were blowouts and four were non-blowout spills.

The historical record for oilspills occurring from pipelines on the outer continental shelf of the United States is only seven spills from 1964 to 1979. This amounts to about 0.6 billion barrels of oil transported via pipelines per spill incident. The third spill statistic used by the USGS is for tanker transport incidents, which are determined on a worldwide basis from 1969 to 1973. In this case, there were 178 incidents greater than 1,000 barrels reported, or about 3.9 spills for every billion barrels of oil transported by tanker. Worldwide tanker data is used for two reasons: 1) no complete record of U.S. owned tanker incidents is available and 2) past U.S. OCS production has moved almost entirely by pipeline rather than tanker, resulting in insufficient data for reliable statistical analysis. The four expected spills, based on the resource estimate of the proposed sale area, are merely an additive function of spills from platforms, pipelines, and tankers.

When using past spill rates as indicators of future spill rates, a decrease could be assumed to follow based on experience and improved standards. This may explain in part the low spill rate and spill volume which occurred in upper Cook Inlet from 1971 to 1980. Conversely, an increase in spill rate may occur due to some unknown conditions in a new or frontier lease area. This assumption is supported in part by the higher spill rate in upper Cook Inlet from 1965 to 1970 (see Table V.B.2-1). The USGS analysis of spill rates takes a middle ground position between these two assumptions and thus uses a spill rate that is strictly a function of volume of oil handled.

The major problem with using a smaller data base, such as upper Cook Inlet in Alaska, is that the data base is likely too small to say whether the spill rate is different from that of the U.S. OCS. Oilspills are infrequent events. Using U.S. OCS platform spill statistics, there is a 34-percent chance that no platform spills would have occurred in Cook Inlet from 1965 to 1981. That is, the spill rate for Cook Inlet is not statistically different from that of the U.S. OCS.

Another factor to consider is the number of spills and volume of oil produced. While the number of spills and spill volume has decreased significantly from 1971 to the present, the volume of production has also decreased significantly from 79 million barrels in 1971 to 43 million barrels in 1979. The data base is further obscured for the upper Cook Inlet activity by those incidents in which the volume of several spills was not recorded (Table V.B.2.-1).

It was also suggested by industry that Canadian Arctic or North Sea statistics should be used rather than those for the U.S. OCS. First of all, regulations

Table V.B.2.-1
Oil Spills in Upper Cook Inlet, 1965-1980

Year	Production Volume (MMbbls)	Oil Industry Spill Volume bbls	Oil Industry Spill Volume Incidents	Other Sources Spill Volume bbls.	Other Sources Spill Volume Incidents	Unknown Sources Incidents
1965	1	160	1			0
1966	14.4	4,855	28	30	2	13
1967	29.0	1,824	47	10,000	1	26
1968	66.1	1,070	49	389	17	18
1969	74.3	918	21	6,243	10	12
1970	81.0	1,039	23	3,984	9	31
1971	79.0	72	12	1,794	6	15
1972	74.0	19	8	32	7	1
1973	73.1	24	6	29	8	1
1974	72.2	19	25	268	7	4
1975	72.0	12	3	18	4	3
*1976	67.0	52	13 (3)[1]	28	19 (6)[1]	5
*1977	66.1	12	14 (1)[1]	16	26 (6)[1]	8
*1978	50.1	14	7 (2)[1]	7	18 (4)[1]	10
*1979	43.0	4	6 (1)[1]	18	15 (2)[1]	5
*1980		8	4	55	9 (3)	4

Figures 1965-1975 are from BLM, FEIS Lower Cook Inlet Sale CI

*This part of the table was compiled by ARCO using records obtained from the U.S. Coast Guard in Anchorage, Alaska.

[1]The number in parentheses indicates the number of spill incidents for which there was no volume report.

governing foreign oil operations are appreciably different from those governing the U.S. OCS. Secondly, as for the Canadian Arctic experience, there has been no Canadian Arctic oil production upon which to base or compare spill statistics.

The OCS oilspill data base is under constant review. Studies are being conducted by USGS and separately by outside contractors sponsored by the BLM studies program. The most recent reviews provide preliminary indications that the production spill rate is beginning to display a downward trend. If this trend is substantiated, the production spill rate used in the oilspill probability model will be changed. Since the oilspill probability model is used for predicting circumstances over periods of two to three decades, there is no justification to alter spill rates based solely upon the limited time and/or production experience of a single geographic region. Consider, for example, that human error is one of the most frequently cited causes for mishaps leading to spills. To limit the historical data base to non- or limited incidence regions, in a predictive analysis, is to suggest a regional dependence on the human process. The central issue to establishing reliability upon regional oilspill data bases is length of experience, measured by time of production and volume produced (assuming that volume produced remains the best exposure variable). An ongoing BLM contracted study is addressing the issue of regionalized data bases and evaluation of alternative exposure variables.

Issue: The relevance of using conditional probability estimates of spill contact in the impact analysis is questioned.

Source: AOGA.

Response: This section has not been rewritten as suggested because it was the intent to describe the conditional probabilities explicitly. Overall probabilities are sensitive to oil resource estimates and therefore subject to variation if new estimates are received. The conditional probabilities do not vary with change in oil resource estimates and provide an index of how development in certain areas may pose risk to wildlife. Therefore, the conditional probabilities should be of great utility to the decisionmaker.

Issue: The conditional and overall probabilities of an oilspill contacting land segments and biological resource targets needs additional explanation.

Sources: AOGA, Marathon Oil Company, and Sohio Alaska Petroleum Company.

Response: Definitions of conditional and overall probabilities are given in Section IV.A.4. A more detailed discussion of their meaning can be found in Sammuels and Lanfear (1981). Very briefly, conditional probabilities refer to the chance of particular targets or land segments being contacted by oil spilled from a specific launch point. The overall probabilities combine chances of spills reaching the target or land segment from all hypothesized launch points and also include the probability of oil structures or oil transportation networks being located at each individual launch point. Which probability--conditional or overall--is used depends upon the question phrased.

The confusion over land segments versus biological resource targets is mostly in the analysis of the Yukon Delta area, which is represented by land segments 2 to 6 (Fig. IV.A.4.c.-2) and by the Yukon Delta Entrainment Area (Fig. J-4). The latter includes biological resources such as salmon and waterfowl which are not on land but which are in the nearshore. Whether land segments or targets are used in the environmental assessment depends upon the resource and impact being considered.

Issue: The effects of weathering should play a greater role in mitigating oilspills than is assumed in the DEIS.

Sources: AOGA and Sohio Alaska Petroleum Company.

Response: The primary category of oilspills considered in the text is 1,000 barrels or greater, NOT 1,000 barrels. A 1,000-barrel spill is the smallest spill considered within the spill size class. Average spill size within this class on the U.S. outer continental shelf for pipelines and platforms is 23,000 barrels. The median is 5,000 barrels. The mean and median are not available for tanker spills, but the maximum could be in the millions of barrels. Thus it would require a 5x to 23x decrease in spill volume through weathering (or cleanup) to remove the mean and median spill from the size category considered and analyzed. Weathering includes dispersion, evaporation, solution, biodegradation, and sedimentation (including absorption onto suspended matter) and is accounted for in the present analysis by concentrating the analysis on the 10-day rather than the 30-day trajectories (see Sec. IV.A.4). When current OCS studies have been completed on the weathering of oil under cold climate conditions, we will further account for the effects of weathering in the impact assessments.

Issue: Habitat rehabilitation measures following a major oilspill should be addressed in the EIS.

Source: Whale Center.

Response: Rehabilitation of the ecosystem is essentially a responsibility of the oilspill cleanup effort (see Sec. IV.A.5., IV.A.6., and Appendix K). Details of a rehabilitation project would be site-specific and dependent on time of year of the spill, spill size, the resource at risk, and likely upon recommendations of various arctic enviornmental researchers. The focus of the EIS is on the proposal to hold an oil and gas lease sale.

Issue: If oilspill cleanup technology and practice (Appendix K) are sufficiently and demonstratedly advanced, then the oilspill risk analysis should be modified to take cleanup into account and the text should include more discussion of cleanup technology.

Sources: AOGA, ARCO Exploration Company, Exxon Company USA, Sohio Alaska Petroleum Company, and Marathon Oil Company.

Response: Cleanup and also weathering are inherently considered in the oilspill risk analysis, as stated in the EIS, by giving three time frames: 3, 10, and 30 days. We concentrate our discussion on the 10-day period, because it takes approximately 10 days to effectively mobilize cleanup efforts for large spills. The median duration of a 1,000 barrel or greater platform

oilspill in the U.S. OCS is 7 days. The USGS requirements for oilspill response are 6 hours for initial response and a 48-hour backup capacity response. There are no deadlines for complete stoppage of a spill or for complete containment or complete cleanup.

Appendix K was requested from the industry oilspill cooperatives; it was provided to BLM as a service and should be considered a statement of the industry's viewpoint. The assumptions and predicted success of the cleanup scenarios in Appendix K, not yet demonstrated in practice in Norton Sound (see Sec. V.A.4.), are as follows:

1. The cleanup scenarios depend heavily on dispersants. Their use is not yet permitted in the Alaska OCS. Also, dispersants are most effective on very fresh oil. Qualified personnel for airborne administration of dispersants are based in Canada and Arizona only. If they were available, and if dispersant use was found to be safe, effective, and approved by EPA and the USCG, it could take days to mobilize this personnel. Some dispersant-oil mixtures are much more toxic than oil alone; also dispersants are not as effective in cold waters.

2. There are discrepancies among arctic studies as to effectiveness of winter burning. It may be very difficult or impossible to ignite oil under normal but cold winter temperatures or normal but high wind speeds. Also, after 48 hours, much of the volatile fraction will have evaporated; and it may be too late to ignite spilled oil without use of an igniter. Igniters are not always successful and contain chemicals potentially hazardous to biota.

3. Although the USGS has access to the entire inventory of cleanup equipment nationally (if available), the time needed to mobilize, transport, and deploy such equipment (as well as logistical support and trained personnel to operate the equipment) could be great.

4. The winter spill scenario assumes that the sea ice with the contained oilspill would not leave Norton Sound. Because much ice in Norton Sound is advected into the Bering Sea, cleanup could be very difficult and very hazardous.

Issue: Oilspill containment, cleanup technology, and enforcement of cleanup regulations are inadequate for Norton Sound.

Sources: AVCP, Whale Center, King Island Native Corporation, Nunam Kitlutsisti, Friends of the Earth, State of Alaska, Sue Comis, City of Teller, St. Mary's, and many testifiers.

Response: The Outer Continental Shelf Lands Act Amendment require that the Best Available and Safest Technology (BAST) be used in exploring and developing oil and gas resources in the outer continental shelf. The OCS operating orders of the USGS require evidence to this effect to be submitted by the lessee prior to any drilling operations offshore. The operating orders also require lessees to submit oilspill contingency plans for approval by the USGS prior to drilling operations. The section on oilspill response describes the type of information required in an oilspill contingency plan. The USGS in Alaska typically requires a 1,000 barrel a day cleanup capability as part of the contingency plans.

The type of action taken in response to an oilspill event is based on the judgment of those responsible on scene in relation to the specific characteristics of the spill, such as the need for protecting life and property through search and rescue operations as well as the source, volume, and type of materials spilled; weather and sea conditions; and proximity to vulnerable coastal habitats. Conditions may exist where other priorities delay offshore cleanup, such as the need to stop an OCS oilspill at the source (as covered in the Memorandum of Understanding between USGS and the U.S. Coast Guard) or the need to protect human life and property (as in the case of the Lee Wang Zin sinking episode near Ketchikan, Alaska).

During a spill the Federal On Scene Coordinator (FOSC) can call in the USGS strike team or an oilspill cleanup contractor if the FOSC is not satisfied with the cleanup effort of the spiller.

The amount and type of cleanup containment equipment available to the FOSC of the U.S. Coast Guard is not limited to the inventory in Alaska. The FOSC has access, if necessary and available, to any equipment in the national roster, although some time may be needed to put the equipment in place. For example, the Glacier Queen spill incident in Seldovia Bay in November of 1978 required the mobilization of a 6,000-foot USN Goodyear boom from Stockton, California, after the failure of booms in Alaska due to the strong tidal action. According to the U.S. Coast Guard log of events, it took 11 days to transport, lay out, and deploy the boom around the Glacier Queen.

There are conditions of weather, sea state, discharge volume, and geography where oil essentially is unrecoverable at sea. In conditions of 8- to 10-foot seas, it may be unsafe to carry on cleanup operations at sea and very difficult to find the oil, since such energy is generated by wind and waves that the oil becomes churned into the water column (Kazmierczak, 1980). In cases where a large volume of oil is released relatively close to shore, such as in a tanker incident, the salvation of beaches may be favorable winds and currents that take the oil out to sea where it can be dispersed naturally (Vielvoye, 1980).

Although the type of response initiated at a spill site depends on the characteristics of the spill, planning for response action takes into account specific characteristics of the lease sale area and the types and location of equipment needed to mobilize response in such a locale. Adequacy of equipment inventories, locations, and response times, among others, are cited in the contingency plan for approval by the USGS prior to the beginning of drilling operations. The contingency plan additionally addresses measures for defending the coast and conducting coastal cleanup. Information on coastal vulnerability to oil persistence and on critical coastal habitats is invaluable for contingency planning and as a means of guiding cleanup decisions of the Scientific Support Coordinator and FOSC.

Issue: The EIS understates the potential consequences of a large oil blowout.

Source: AVCP.

Response: A large, long-term oil blowout is a very unlikely event. The probability of such an occurrence, however, is included in the oilspill risk

analysis (Section IV.A.4.) in the 10,000 barrel or greater category of oilspills. The impact discussions for specific resources in the EIS include state-of-the-art assessments of the potential impacts of such a spill.

Issue: The use of a scale of low, moderate, and high for conditional and overall oilspill risk probabilities is confusing.

Source: Sohio Alaska Petroleum Company.

Response: The low, moderate, and high spill contact probability scale is an arbitrary and relative means of comparing oilspill risks to different targets and different resources. Conditional probabilties show the risks of spill contacts to various targets from a specific projected spill point assuming that a spill occurs. The relative risk scale (0 to 100 percent) applies to all probabilities discussed with respect to the OSRA (see Sec. IV.A.4).

Issue: Spills are assumed to be from drilling sites, yet tanker spills are more probable.

Source: AVCP.

Response: Hypothesized oilspill launch points used in the oilspill trajectory analysis are identified in Figure IV.A.4.c.-1. Tanker spill launch points used in the analysis occur both in and outside of the proposed sale area, along onshore and offshore loading transportation routes described in Section II.A. of the EIS, and in OCS Technical Paper No. 1 (Tremont, 1981). Tanker spill launch points include P8, P11, P12, and P16 and P20 (see Sec. IV.A.4).

3. Environmental Studies and Data Gaps:

Issue: Data gaps in the assessment information for the Yukon River Delta suggest more studies need to be conducted for this area prior to the sale.

Source: AVCP, and Axel Johnson.

Response: Estuarine hydrology, tidal excursion, and local brisk onshore winds around the Yukon River Delta are described in Section III.C.2. Because of the lack of local data on these winds and tides, and possible nearshore entrainment processes, the concept of a broad buffer zone was developed to assess the impacts of oilspills on the Yukon River Delta (Sec. IV.B.2.a. and J-4 and J-5). The size of the buffer zone was chosen to conservatively overestimate impacts of oilspills on the Delta. Analyses of Yukon Delta impacts in Section IV. consider the total potential impact over the entire buffer zone rahter than impact over the much smaller, site-specific Delta land segments in evaluating oilspill impact on specific offshore Delta resources.

Additional data would allow the width of the conceptual buffer to be refined and narrowed, i.e., the magnitude of the assessed impacts for the proposal (Sec. IV.B.2.a.) would be reduced.

Issue: Additional studies are needed to determine the sedimentation process in Norton Sound and the consequences of an oilspill sinking and contaminating bottom sediments.

Source: AVCP, Nunam Kitlutsisti, State Representative Anthony Vaska, Dan Thomas, Bering Straits Coastal Resource Service Area, NRDC.

Response: Sedimentary processes in Norton Sound have been described by the following references in the DEIS: Dupre and Thompson (1979), Larsen et al. (1980), McManus et al. (1977), Nelson and Creager (1977), and Thor and Nelson (1979). In addition, we have added further discussion of impacts of sedimenting and sedimented oil to Sections IV.B.2.a. and IV.B.2.b., Gordon et al. (1976) found that in field experiments, less than 5 percent of an oilspill entered the water column and sediments. Investigations that followed the Chevron spill in Louisiana, showed that less than 1 percent of the oil was identified in the sediments within a 5 mile radius of the platform (McAuliffe et al., 1975). Following the Argo Merchant spill, less than 1 percent of the oil was found in the sediments (Hoffman and Quinn, 1978). The contamination of sediments from the Argo Merchant spill was the result of the mechanical mixing of oil into the sediment by the movement of the tanker's bow section. Current Alaskan OCS studies are underway to model weathering of spilled oil, including sedimentation. When these studies are completed we will attempt to quantatively include sedimentation and other aspects of weathering in the trajectory model.

There is some potential for absorption of oil on suspended sediments in Norton Sound. Western Norton Sound surface sediment and the suspended sediment load are primarily detrital rock debris. Experimental data suggest such sediments can adsorb up to 11 percent by weight of crude oil (Norton Sound Synthesis). The Yukon River sediment load is 88×10^6 MT per year (Norton Sound Synthesis). Major storms in Norton Sound can scour and resuspend up to a half meter of sediment. Thus, the most likely occasions for sediment-oil interaction in Norton Sound would be either off the Yukon Delta or during storms.

The likely fates of any oiled suspended sediments can be inferred from Norton Sound studies. The Yukon River plane does not appear to enter the eastern sound (Muench et al., 1981). Any oil entrained in the plane from the proposed lease area in the western sound would tend to circulate within the western sound and northeastern Bering Sea. The western sound is poorly stratified (Muench et al., 1981) and entrained oil would also become greatly diluted. During peak sediment load period of the Yukon River - when the potential for sediment-oil interaction should be otherwise greatest - river flows as high as 3×10^4 cubic meters per second (Muench et al., 1981) would tend to both disperse any adsorbed oil and divert it offshore, away from the delta. In addition, local winds tend to be offshore near the delta during peak runoff (Roy and Dupre, 1981) and would tend to keep a surface slick away from the river plane.

Movement of a salt wedge up the Yukon River could carry entrained oil into the Delta during the winter period of low flow. However, there is no mechanism which would concentrate subsurface oil from an offshore spill within the salt wedge. To move appreciable quantities of oil up the salt wedge, a spill would have to 1) occur at the mouth of the river or reach the mouth intact from offshore and 2) occur at time of appreciable salt water flow up the salt wedge. The oilspill trajectory analysis indicates that the probability of the first condition being met is no more than 1 percent over the life of the proposed field. Furthermore, there is a great likelihood that the next spring's flood would flush any entrained or sedimented oil from the salt

wedge. Part of the reason for the very low probability of oilspill contact with the Delta is that USGS estimates that only gas, no oil, in those lease blocks closest to the delta.

Fate of oiled suspended sediments which reach the bottom can also be addressed from Norton Sound and other northern Alaskan studies. Weathering of oil and other materials in arctic marine waters and sediments is very slow (Atlas et al., 1978). Following initial evaporation and chemical degradation, loss of oil is slow and there are almost no further changes in the chemical composition of the residual oil. Atlas found that fresh Prudhoe Bay crude was toxic to indigenous sediment invertebrates, but that recolonization by less sensitive species of invertebrates occurred within 2 months.

The benthic environment of Norton Sound is very dynamic; reworking of oiled sediments rather than weathering of the oil would likely be the dominant cleansing mechanism. There are three major ways sediment reworking would occur. First of all, the coupled high sediment load and flow of the Yukon River would annually scour, dilute, or bury sedimented oil near the Delta. Secondly, the portion of Norton Sound nearest the Delta has the highest rate of ice gouging in the entire sound: 5 gouges per kilometer per year (Thor and Nelson, 1981). At an average width of 15 to 25 meters (Thor and Nelson, 1981), these gouges indicate effective reworking of 10 percent of the bottom to a meter depth each year. Thirdly, the frequent major storms scour and rework up to half a meter of sediment in Norton Sound (Nelson, 1980). Scour is not intensive around and beneath objects. Thus, matted oil would likely be scoured, abraided, or buried during storms and unmatted oiled particles would likely be greatly diluted and buried.

Section IV.B.2.a. in the FEIS addresses the possibility that oil could be entrained in the bottom sediments around the Yukon Delta and possibly contaminate the benthic community of this area. However, because the diversity and biomass of benthic infauna and epifauna of this area are relatively low (Feder and Jewet, 1978) no significant impacts are expected. Additionally, Section IV.B.2.b. in the FEIS addresses effects on prey organisms used by demersal fish. This section concludes that bivalve molluscs (clams and cockles) could be affected because they tend to retain certain hydrocarbons for longer periods.

Issue: The distribution of Yukon River salmon smolt upon leaving the Delta has not been studied sufficiently.

Sources: Tanana Chiefs Conference, Inc., and Kawerak, Inc.

Response: While it is true that studies have not been conducted to provide direct information on salmon smolt distribution upon leaving the Yukon River Delta, it can be reasonably assumed that these young fish do remain in nearshore (coastal) waters in the vicinity of the Delta region for an undetermined period of time. During this period, these young fish are feeding, growing, and developing for movement farther offshore.

For the purposes of impact assessment, this period is assumed to be from the onset of spring break up through the summer and into early fall (May through September). This assumption is corroborated by observations of juvenile sockeye salmon in Bristol Bay (Straty, 1981) and juvenile chum and pink salmon

in Golovin Bay (Barton, 1979). In Bristol Bay juvenile sockeye salmon first appear in coastal waters at the onset of breakup, with their peak abundance in nearshore waters occurring in late May and early June. Chum and pink salmon juveniles in Golovin Bay were observed from early June to early July. It is generally accepted that all five salmon species behave similarly even though the timing of seaward movement may be somewhat different.

Movement of juvenile salmon in coastal waters is dependent on a number of physical and biological conditions such as temperature, salinity, and food availability. Therefore, movements of large aggregations of juveniles would not be consistent from year to year. For the purposes of this analysis, the entire nearshore area, particularly in the vicinity of river mouths is considered critical for juvenile salmon.

Issue: The EIS has failed to properly use the synthesis process for Norton Sound.

Sources: AVCP, State Representative Anthony Vaska, Dan Thomas, Axel Johnson, and Kawerak, Inc.

Response: The Norton Sound Synthesis Meeting in Anchorage, October 28-30, 1980, included numerous discussions based on studies conducted by the OCSEAP investigators. The results of this meeting have not yet been published in a final form, however, these results and numerous OCSEAP studies conducted by the meeting participants have been incorporated thoroughly into the EIS. OCSEAP studies have been incorporated in Section III.C.1.; Vulnerable Coastal Habitats, Yukon River Delta in Section III.C.2.; Fish Resources in Section III.C.3.; Birds in Section III.C.4; Marine Mammals in Section III.C.5; Terrestrial Mammals in Section III.C.6; Endangered Species in Section IV.B.2.e.; and Impacts on Biological Resources in Section IV.B.2.a.-e.

C. Environmental Impact Assessment

1. Physical Considerations:

Issue: A discussion of Norton Sea ice types should include polar ice, or kulusik, which is older and more compressed than other ice and originates in the Polar region.

Source: George Noongwook.

Response: The discussion about the Norton sea ice is based, for the most part, on satellite imagery along with some on-site observations. Polar ice, or kulusik, is included as a part of the Bering Sea oceanic ice or pack ice discussion (Sec. III.A.1).

Issue: The availability and adequacy of oceanographic, meterological, and geological data for the Norton Sound area is in question.

Sources: AVCP; Maniilaq, Kawerak, Inc., and NRDC.

Response: Knowledge about the physical environment of Norton Sound has been acquired by various means. As a background, there is the historical information based on previous investigations and data about features which are

found in Norton Sound but have been studied in other areas. The type of information needed to determine the environmental impacts of outer continental shelf petroleum development in the proposed lease sale area was determined through 1) a series of scoping meetings in various communities in the Norton Sound area, Anchorage, and Juneau, and 2) synthesis meetings of principal investigators, staff members of federal, state, and local governmental units; and representatives of industry. One purpose for these meetings was to define issues of concern about the physical environment, determine subject areas where additional information was needed, and suggest studies that would provide the required data. The BLM Environmental Studies Program has supported many of these studies. Information can also be acquired from investigations sponsored by other organizations or institutions. Also, the petroleum industry conducts studies of the physical features of the Norton Sound area but, at present, much of this information is proprietary.

As a result of these procedures, many reports and articles are published in scientific and engineering journals and papers are presented at conferences. These articles and papers describe the physical enviornment of the Norton Sound-Bering Sea area; interpret the data based on present scientific and engineering knowledge; and, in some cases, consider how the physical features of the area will affect the exploration and development of petroleum resources. The EIS presents only a summary of all the information about the physical environment that is needed to address that major relevant concern and to assess and manage the environmental impacts of oil and gas development on the outer continental shelf.

Some of the events described by the commentors provided additional information about the environment and are included in Section III.A.1.a. In addition, the descriptions of several of the hazards in Section III.A. and IV.A.7. have been revised to indicate briefly the amount of scientific information that is available about these features.

Issue: The importance of storm surges in the Norton Sound area was not adequately addressed.

Sources: AVCP, NRDC, Michael Albert, Pete Kapanuk, Gregory Joe, Regina Andrews, Jasper Joseph, Cecilia Foxie, Alfred Redfox, Alma Keyes, Ignatius Murphy, and Dwight Milligrock.

Response: Storm surges are discussed in Sections IV.A.1.e., and IV.A.2.f. of the text. Storm surges are relatively infrequent events and only a few storms produce major surges (Brower et al., 1977). Most of the damage from major surges is derived from invasion of low coastal areas by high storm waters rather than by high winds and large offshore waves.

The winds which produce surges in Norton Sound are included in the Rand oilspill trajectory analysis. Note that both oilspills and surges are relatively infrequent events; there is very roughly only a 0.05 percent chance that an oilspill and storm surge would occur in the same month over the entire life of the field.

Issue: Information in the DEIS on storm surges should be reorganized and expanded.

Sources: Mike Albert, Pete Kapanuk, Gregory Joe, Regina Andrews, Jasper Joseph, Cecilia Foxie, Alfred Redfox, Alma Keyes, and Ignatius Murphy.

Response: The information was reorganized to 1) show that storm surges may affect all of Norton Sound, 2) indicate the causes, and 3) describe some historical storm surge events (see Sec. III.A.1).

Issue: No mention of wind statistics appears in the DEIS, other than in description of storm surges.

Sources: State of Alaska, NOAA, and Robert Foote.

Response: Wind statistics are summarized in Tables III.A.2.a.-1, III.A.2.a.-2, and III.A.2.a.-3. Wind/ice relationships are discussed in Section III.A.2.d. A brief discussion of wind statistics used in the oilspill risk analysis model has been added in Section V.C.1. Note also that the role of wind in transporting ice and oil is incorporated in the oilspill trajectory model discussed in Section IV.A.4. and Appendix J. Further discussion of wind and ice in the model can be found in Liu and Leendertse (1981).

Issue: The Bering Sea pack ice is stronger and therefore not comparable to other ice.

Source: Roger Silook, Irene Katchatag, Othnid Oomittuk, Rudolph Williams, Nick Chanar, Guy Mann, Catherine Buster, and Evan Uisok.

Response: Bering Sea ice is first-year, relatively thin ice, generally 0.7 to 1.2 meters thick (Thor and Nelson, 1981). First-year ice in the Beaufort and Chukchi Seas reaches about 2 meters thickness (sale BF FEIS [USDI, 1979]). Pack ice in these more northern extremes is multi-year which persists through the summers. The surface melting which occurs in summer washes out residual salt leaving much fresher and, as a consequence, stronger ice in the Beaufort and Chukchi Seas.

Issue: More input by local inhabitants is needed on ice to supplement the information gathered by the OCSEAP investigators.

Sources: AVCP; Irene Katchatag; Robert Foote; Othniel Oomittuk; Dwight Milligrock, Sr., and the Bering Straits CRSA Board.

Response: Historic observations (provided at the public hearings) of ice motion by residents of the Norton-Sound area were incorporated into the discussions of the ice movement phenomenon (Sec. III.A.1.a.) in the stable fast ice, flaw lead, and nearshore pack ice zones (Sec. III.A.1.).

Issue: More information was needed on the liquefaction of sediments.

Source: AVCP and Kawerak, Inc.

Response: This section (Sec. III.A.1.c.) was revised to indicate 1) the factors which effect sediment liquefaction and 2) the areas in Norton Sound where the sediments are more susceptible to this phenomenon.

Issue: The information of faults in Norton Sound is incomplete.

Source: AOGA.

Response: Section III.A.1.b. was revised to include a summary of the current knowledge regarding faults in Norton Sound which indicates, as noted by the commentor, an area of low siesmicity.

Issue: Information in the DEIS on mining prospects in the Brooks Range was incomplete.

Source: U.S. Bureau of Mines.

Response: Portions of this section were revised to include comments regarding other mining prospects in the Brooks Range.

2. Social Systems:

Issue: The graphical information portrayed on subsistence harvests in the Norton Sound lease sale area shows the need for additional research.

Sources: State of Alaska; Dan Thomas; Ken Hamm; Tanana Chiefs Conference, Inc.; Robert Wolfe; and AVCP.

Response: In addition to revisions and amplifications provided in this FEIS, a number of studies currently underway or recently completed for the Norton Sound, Bering Strait and Yukon Delta areas considerably improve the general knowledge base regarding subsistence use areas and practives: Dan Thomas, "The Role of Local Fish and Wildlife Resources in the Community of Shaktoolik, Alaska," forthcoming; Dan Thomas, ADF&G, Subsistence Division, "Norton Sound-Bering Strait Subsistence King Crab Fishery," 1981; Robert Wolf, "Yukon Delta Sociocultural Systems Study," November 1981; Muir Associates, Inc., "Harvest Disruption Sociocultural Impacts," forthcoming in 1983. Scheduled studies for completion in 1983 include St. Lawrence Island and Unalakleet subsistence harvest disruption. Additional studies performed as planned for the Alaska OCS Socioeconomic Studies Program on subsistence use in the Norton Sound, Bering Strait, and Yukon Delta regions in 1981-1983 include Riordan, 1981, Navarin Basin Sociocultural Impacts Study and Norton Basin Sociocultural Impacts Study, 1982.

In conjunction with maps and assessments of biological habitats and resources in the Norton Basin area, this mapped information is judged adequate for purposes of the present lease sale decision.

Issue: The subsistence information portrayed in Graphic 2A, 2B, 2C, and Table III.B.3.-1 should be qualified to recognize different data bases and should incorporate new information collected by the Subsistence Division of ADF&G.

Sources: Dan Thomas, State of Alaska, Mark Akitkun, and George Noongsvook.

Response: These maps and table represent the latest available information. They include a reproduction of a map produced by ADF&G which was the best available composit of region-wide subsistenc harvest data at the time of the

DEIS. Subsistence graphics 2A-2C have been improved with the new information provided and with the corrections suggested by sources listed above and the Nome ADF&G office. See also Figure III.C.1.-1, which has been added, from Wolf, 1981. Table III.B.3.-1 has been revised to incorporate new information provided by the above sources.

Issue: There is a lack of consistency between the subsistence and biological assessments.

Sources: AVCP, AOGA, State of Alaska, and Dan Thomas.

Response: Chart IV.B.1.c.-3 has been revised where appropriate in response to a wide variety of comments which showed a need for clarification of sources of information and purposes served by the chart. Discussion of Yukon Delta vulnerable coastal habitat has been revised to reduce inconsistencies with subsistence discussions in Section IV.

Issue: Long-range effects on the subsistence way of life are not discussed.

Sources: AVCP, Gilbert Lockwood, Philip Foxie, Axel Johnson, Mike Semon, Paul Phillip, Anna Kamkoff, Theresa Peoples, Charles Harry, Sr., Della Trader, Susan Peterson, and Larry Chiklak.

Response: Sections III.B.1. and 3. and IV.B.1.a. and c. do discuss present and historical and subsistence use patterns and project their probable change with the proposed lease sale. Cumulative impacts on subsistence use from current firm energy proposals are also discussed in Section IV.B.1.c. While these discussions are brief, in keeping with NEPA guidelines on the length of EIS's, the background studies cited throughout these sections and from which the information presented is drawn, do provide greater time depth and complexity of discussion needed to more comprehensively analyze the system as a whole and its inter-connecting parts. The DEIS does conclude, however, that a maximum period of boom-related resource pressures, conflicts, and changes will be followed by a lessening of these conflicts, pressures, and changes over time, if development proceeds. If exploration yields uneconomic oil and gas resources and development does not proceed, even these changes will not occur. If the exploratory period does yield promising resources warranting oil and gas development, then a developmental EIS would also be prepared which would be based on the latest oil and gas resource information as well as updated biological and sociocultural studies in the area.

Issue: The unique way of life of the Eskimo and Athabascan Indians is threatened with extinction by this lease sale.

Source: David Marshall, Roger Silook, Della Trader, Patrick A. Gologergen, Joseph Noongwook, Waslie Eakon, Jane Koutchak, Isaiah Towarak, George Lockwood, Gabriel Yunak, Theresa Tonuchuk, Lawrence Chugach, Sarah Cheevok, Alton Wallick, George Dann, Sr., Francis Thompson, Susan Peterson, Theresa Peoples, Charles Hary, Sr., and Anna Kamkoff.

Response: Sections III.B.1.3. and IV.B.1.c. do discuss the concern of local residents for their traditional way of life and possible irreparable changes to that way of life.

While these fears and concerns are recognized in the EIS, the impact assessment concludes that long-term significant disruption of village-centered subsistence ways of life is unlikely to occur. This conclusion is based on the comprehensive analysis of biological, sociocultural, industrial, and project-specific research, cited in the sections of the EIS or in the Bibliography.

Issue: Cash equivalents for subsistence harvests need to be calculated in the DEIS.

Source: Simer E. Seesak, Larry Chiklak, Rural CAP, Mike Simon, Paul Phillip, and Debbie Traske.

Response: Village-centered subsistence economies are both qualitatively and quantitatively different from urban economic systems, even within the State of Alaska. Cash substitute for this way of life cannot be meaningfully calculated. While studies of potential cash equivalents to subsistence foods have been calculated for at least one village in the lease sale area (Kotlik in Wolfe, 1977) this approach was not considered for the lease sale area as a whole. Sociocultural studies completed for this EIS have emphasized qualitative analysis of the unique ways of life and patterned activities which support these ways of life. For the most part, alternative resources (food, fuel, subsistence technology) are not readily available locally in any event. Local residents have no choice in the way of life they pursue since stores, where they exist, are stocked with few urban amenities. Urban comparisons are thus both misleading and potentially meaningless given the lack of alternatives available to local village residents.

Issue: Information portrayed on the subsistence graphics and Table III.B.3.-1 need to incorporate new information recently collected by Subsistence Division, ADF&G and should not designate different levels of quality in the data.

Source: Dan Thomas, State of Alaska, Mark Okitkun, George Noongsvook.

Response: The subsistence graphics and Table III.B.3.-1 have been substantially improved with new information provided and with corrections suggested by source listed above and the Nome ADF&G office. See also Figure IV.B.1.c.-1 which portrays fish camp locations for Yukon Delta villages, from Wolfe, 1981. Table III.B.3.-1 has been revised to incorporate new information.

Issue: The respective worth of renewable as opposed to non-renewable resources in Norton Sound has not been addressed.

Source: NRDC.

Response: Recent legal responses to the issue of priority use of Alaska's fish and game resources by subsistence users has initiated changes in Alaska Fish and Game Management, including rapid expansion of ADF&G's Subsistence Division. Due to the sketchy and usually under reported subsistence catch data available prior to passage of state and federal subsistence law (ANILCA) most knowledgeable social scientists in the state are reluctant at this time to attempt to equate dollar values of subsistence harvests with urban equivalents. For the purpose of this proposed lease sale decision, studies have

emphasized qualitative rather than quantitative analysis of the importance of subsistence harvests to the people of the Bering Strait, Norton Sound, and Yukon Delta areas. Once the level of subsistence use for the area as a whole is more thoroughly documented, it would be possible to perform equivalency measurements. Wolf, 1977, is a study of Kotlik in the present lease sale area which has attempted to provide dollar values for subsistence harvests in the mid 1970's. The diversity of subsistence systems, food prices, other economic costs and related considerations needed to produce a region-wide analysis comparable to Wolf's has not been attempted in this lease sale area due to time, budget, and data deficiencies.

Issue: The DEIS shows that the proposed OCS oil development would benefit the minority of the residents of Norton Sound but would be of negative social, cultural, economic, and psychological results to the majority.

Source: Roy D. I. Johnson.

Response: The purpose of an EIS is not to justify a sale but to point out the environmental and social consequences of deciding to proceed with the lease sale or one of the alternatives. Beneficial impacts often become more evident once exploration and development activities actually occur. See, for example, Kruse et al., 1981; Kleinfeld et al., 1981; sale 55 FEIS. The OCS leasing program is a national program, mandated by law. While it may seem inequitable to certain regions of the country, the Secretary must consider the national interest and balance orderly development of the OCS with regional environmental concerns.

Issue: An oilspill could affect salmon smolt which in turn could destroy the economic base for interior villages along the Yukon River.

Source: Tanana Chiefs Conference, Inc.

Response: The probability of an oilspill contacting Yukon Delta salmon smolt in sufficient concentrations to affect a year class of a salmon species is extremely unlikely, although it could possibly occur under some very unlikely unique combination of conditions. If this were to occur, salmon populations could be reduced from 2-5 years, depending on the species affected. The risk is extremely low. It should not be assumed that oilspills are a certainty or that they will occur exactly in the most unfavorable locations that affect salmon.

During this 2-5 year period, villages dependent upon salmon for subsistence could experience an undetermined reduction in catch. If distributed over the entire Yukon River, this reduction would probably be inconsequential for each individual family. Normal practices of substitution of resources such as increased non-local hunting or increased winter fishing might occur during this period. Cook Inlet fishery statistices indicate the link between catch levels and oil and gas development in the Cook Inlet may be positive rather than negative. In fact, most Cook Inlet fisheries have experienced increased catches, rather than reductions, over the life of Cook Inlet oil production. See Technical Report #30, Northern and Western Gulf Commercial Fishing Impacts Analysis, 1980. It is extremely unlikely, given the above, that significant or even meaningful impacts on villages beyond those already discussed in Section IV.B.1.c. would occur even with a large oilspill event, which itself

is not likely. This is not to deny the importance of Yukon River salmon to villages and families from St. Marys to the Canadian border. The possibility of "destroying the economic base" of these villages, however, is highly unlikely. See Section IV.B.2. for more discussion of oil-fisheries interactions.

Issue: The history of oil industry enclaves in Alaska suggests they are almost totally self-sufficient, and a similar enclave in the Nome area would minimally affect Nome area subsistence use, sociocultural systems, and town infrastructure and economy.

Sources: AOGA, Exxon Company, USA, and Sohio Alaska Petroleum Company.

Response: In formulating the scenarios and population assumptions for this DEIS, comments and technical direction were received from industry, local institutions, knowledgeable social scientists, and others about the probable response of the Nome community to various types of enclave settlements. It was determined after these consultations that a strict enclave patterned after Prudhoe Bay or Yakutat was not what the community wanted and was therefore unrealistic as an assumption. A recent Draft Coastal Management Plan substantiates this view. It includes a survey which asked questions of a representative sample of Nome households concerning OCS development and siting of facilities. Seventy percent of Nome households favored OCS development and 48 percent favored a site for onshore facilities in or near Nome. Sixty-six percent were opposed to annexation of additional city lands. Only 24 percent favored locating facilities away from Nome altogether (Environmental Services Ltd., 1981). Clearly these town attitudes will affect community and industry negotiations about levels of separation between industry and town personnel, housing, facilities, services, and related matters. This negotiation process is dynamic and cannot be incorporated into the assumptions which drive the social systems analysis. For further discussion of various types and degrees of enclave or separation of industrial facilities from communities see Berger and Associates, 1981, and subsequent products forthcoming. This study attempts to model various types of enclaves and their accompanying cultural, social, economic, and political changes, based on extensive national and international experience with energy development.

Issue: Local people will not be consulted or involved locally in oil and gas related activities which affect them.

Source: AVCP, State Representative Anthony Vaska, Joan Haig, Rose Atuk, Rural CAP, Kawerak, Inc.

Response: There are a number of points in the leasing process where public input is both sought and welcomed, including "scoping," public comment periods, and hearings. In addition, input into oilspill contingency planning and the orientation program stipulation are strongly encouraged in this FEIS (Secs. II.B.1.c., IV.A.5. and 6., and IV.B.1.c.). Locally based OCS advisory committees or representatives now being formed in the Bering Straits and Calista regions will also serve as channels of communication about pending industry actions of concern to local residents.

Issue: The word "lifestyle" implies a choice which is inappropriate in the Bering Strait region where people's ways of life have been passed down through generations, for the most part unchanged.

Source: AVCP, Dan Thomas.

Response: The FEIS text was changed to "way of life" where appropriate.

Issue: The severity of sociocultural impacts to be expected is minimized in the DEIS.

Source: Norton Sound Health Corporation.

Response: Revisions were made in Sections III.B. and IV.B.1.

Issue: Concerning Nome area attitudes toward OCS, a recent survey for the CZM program was not referenced, or used in the analysis.

Source: Environmental Services, Ltd.

Response: See revisions in Section IV.B.1.a.

Issue: Table III.B.4.-3 needs to be corrected.

Source: State of Alaska.

Response: Table III.B.4.-3 has been corrected in this FEIS.

Issue: The king crab summer target discussion in Section IV.B.1.c. which lists Unalakleet and Shaktoolik as dependent on this harvest for commercial rather than subsistence purposes is incorrect.

Source: State of Alaska.

Response: New data from ADF&G Nome office has corrected this error. Graphic portrayal of subsistence crabbing areas has also been imporved by recent study data, including Thomas, 1981, and Thomas, 1981 ("Shaktoolik Report" and "Norton Sound-Bering Strait King Crab Fishery Report").

Issue: Data on utilities and housing in the section on Nome community infrastructure should be reviewed in light of the new information on these topics contained in the Nome Coastal Management Plan Background Report.

Source: Environmental Studies, Ltd.

Response: The information in Section III.B.5. was updated on the basis of the new data.

Issue: The section on Nome's Community Infrastructure should include a recent Planning Commission recommendation for a site for a new regional detention facility and the resurrected 1901 boundary for Nome's corporate limits.

Source: Environmental Studies, Ltd.

Response: Information on the regional detention facility was updated in Section III.B.5. Nome's new boundaries are used as the city limits in Sections III.E.4., III.E.5., and IV.H.4. Where data in the text were specific to the previous city limits, the term "townsite limits" has been used.

Issue: Shortage of building sites should be identified in the EIS as a factor discouraging public housing projects.

Source: Environmental Studies, Ltd.

Response: This factor has been included in the analysis of the city's participation in government financed housing, Section IV.B.1.e.

Issue: Persons dislocated from Nome will create an impact upon the areas of relocation.

Source: Bureau of Indian Affairs.

Response: The potential impact of dislocated persons from Nome has been included in Section IV.B.1.e.

3. Biological Resources:

Issue: Statements summarizing the Norton Sound Synthesis Meeting regarding the adequacy of cleanup technology for an oilspill reaching the Yukon River Delta (page 17 of the DEIS) are contradicted by the oilspill cleanup contingencies presented in Appendix K of the DEIS.

Source: State of Alaska.

Response: These statements regarding the adequacy of cleanup technology for the Yukon Delta have been changed in the FEIS to be consistent with Appendix K.

Issue: Dredging and redeposition of fill material for gravel islands are two potentially significant activities that could be disruptive to local benthic fauna. This should be indicated in the discussion on page 146, third paragraph.

Source: State of Alaska.

Response: While these two activities could produce local adverse impacts to benthic communities in other OCS areas, they are judged to be insignificant in the context of the discussion on page 146. The sediment load discharged by the Yukon River (70 to 90 million metric tons annually) would mask any effect from "dredging and redeposition" in this area near the Delta. Secondly, benthic communities in this area are already depressed (Feder and Jewett, 1978) as stated in the text.

Issue: The short- and long-term ramifications of an oilspill in the area around the Yukon Delta have not been addressed in the DEIS.

Sources: AVCP, NRDC, Marine Mammal Commission and many testifiers.

Response: This issue has been expanded in the FEIS, in Section IV.B.2.a.

Issue: The DEIS did not discuss how the loss of a dominant year-class of herring could have significant consequences to future population size and harvest.

Source: State of Alaska.

Response: This issue was not discussed because it was felt that a strong year class would not be susceptible to significant reduction by an oilspill. However, if this did occur, local population levels and subsequent catch could be reduced by an indeterminant amount for several years. The effect on future year classes (progeny of the dominant year class) may or may not be significant. This would be more dependent on environmental factors rather than the number of eggs or spawning adults.

Issue: The DEIS fails to discuss the possible impacts of chronic pollution which would place long-term stresses on the invertebrate and fishery resources of the area.

Source: Whale Center, Friends of the Earth, Peter Okitkun, David Nanalook, Paul Phillip, Agnes Teeluk, Joseph Mike, Joseph Aparezuk, Jeannie Waska.

Response: Sources of chronic pollution that are anticipated by development of oil and gas activities in this region under the various development scenarios provided in the FEIS include discharges of drilling effluence and formation waters from drilling platforms, discharges of ballast water near areas designated for storage and loading (i.e., Cape Nome area complex or offshore loading terminals), and discharges of various sanitary and industrial wastes from drilling platforms, storage and loading complexes, and OCS vessels. Additionally, accidental discharges such as fuel oils or other hydrocarbons may also result.

These sources of chronic pollution are discussed briefly in the "Impacts of Water Quality" (Sec. IV.H.6.), however, detailed discussion was reserved because no significant impairment to water quality or aquatic life was anticipated. This finding is based on the fact that all of these discharges except those that are accidental are regulated by various governmental authorities (refer to Alaska OCS Technical Paper #4). This regulation is in place to mitigate the possible impacts that are part of this issue. Additionally, these discharges have been shown to affect the water column and sea bottom only short distances from the point of discharge (within a few hundred meters). Even though these discharges would produce localized effects over a very small percentage of the lease area, they would not severely impair or produce any measurable effect on the fishery resources of the region.

Issue: The fisheries graphics are incomplete.

Sources: State of Alaska, and AVCP.

Response: Some of the areas of relatively low abundance for some species or where the potential for adverse impact from oil development were deemed unlikely, were not depicted to maintain clarity.

Issue: The comparative value of chum and pink salmon vs. king salmon is erroneous; king salmon are of greater value.

Source: AVCP.

Response: When economic and subsistence values are combined we believe chum and pink salmon have more value to the local inhabitants than the king salmon. The king salmon is generally not as heavily used for subsistence purposes. Although present catch and price for king salmon are both high, it remains to be seen if this relatively recent trend will continue. Historically, chum and pink salmon have been the most numerous and of greatest economic and subsistence value. All 3 species are of considerable importance and value.

Issue: The description of the lower Yukon Delta commercial fishery is both out-of-date and erroneous.

Source: AVCP.

Response: Economic values for salmon harvested in Norton Sound were the most recent available when this portion of the DEIS was prepared. The FEIS incorporates updated statistics.

Issue: Pacific herring may be subject to extended periods of vulnerability to oilspills.

Sources: AVCP, Nunam Kitlutsisti, and Henry Ivanoff.

Response: While the DEIS does not clearly define what constitutes a "short" period for herring vulnerability to oilspills, this FEIS defines this time to be generally the period from spawning to hatching of the eggs. After the eggs hatch, it is assumed the resultant larvae would disperse throughout the nearshore waters of Norton Sound, making it unlikely that they would be contacted by an oilspill to any significant extent.

Dependent to some degree on water temperature, the eggs of Pacific herring hatch in about 10 days. With spawning probably in progress over a 3-4 week period annually, eggs could be subjected to oilspills over an estimated period of 40 days. The estimated period for larvae is slightly longer.

Issue: Herring migrating through the lease area would be subjected to oilspills.

Source: Henry Ivanoff.

Response: We do not feel that herring migrating through the proposed lease sale area would be significantly impacted by an oilspill. The schools would, be highly mobile and may tend to avoid oil, including its water-soluble fractions.

Issue: One year class of herring could be destroyed by an oilspill.

Source: AVCP, U.S. Fish and Wildlife Service, and Henry Ivanoff.

Response: It would be very unlikely, given spawning area and period, for one year class (of herring) to be totally destroyed by an oilspill. Given the broad nearshore distribution and timing of herring migrations, it appears unlikely that significant part of either the spawning population or larvae would be impacted by an oilspill.

Issue: Additional loss of herring eggs due to oilspills would increases already large natural egg mortality.

Source: Henry Ivanoff, AVCP, and Nunam Kitlutsisti

Response: Natural flunctuations in herring egg survival from optimum success to minimum levels would mask any additional loss from an oilspill, except possibly during a year of almost complete failure. The probability of an oilspill further impacting on this disastrous event is very unlikely.

Issue: If onshore development takes place in the southern region, it may very well be based in prime herring spawning areas.

Source: AVCP.

Response: As noted in the EIS, it is highly unlikely that any major onshore oil development facility would be sited in the southern region because of topography and limited ocean depth. Present indications are for construction of this nature to be located at Cape Nome. Also, existing coastal villages do not seem to affect adjacent herring spawning/rearing habitat to any significant degree. Relatively large communities, such as Sitka have herring spawning relatively close to their boundaries. Finally, agency and public review during the planning of this development could prevent impacts to these habitats.

Issue: A serious contradition exists about chronic oil pollution, over a period of years, reducing herring populations as a result of large spills occurring over a short period.

Source: Texaco, Inc.

Response: The EIS has been revised to clarify this section (Sec. IV.B.2.b.).

Issue: Oilspills mentioned repeatedly as chronic throughout Section IV.B.2.b. are illegal, unnecessary, and most undesirable, as much for the oil industry as for everyone else.

Source: Texaco, Inc.

Response: Section IV.B.2.b. of the FEIS now treats spills as single events rather than chronic.

Issue: Salmon populations in the lease area could be adversely impacted by oil development to the level of elimination of the fishery for years, therefore a worst case analysis should be done.

Source: AVCP, and State Representative Anthony Vaska.

Response: Adverse population impacts on salmon would be most limited both in time, area, and effects on the fish. While an oilspill onshore might divert and/or delay adult and smolt salmon migrations, it is doubtful that there would be resultant significant reductions in these runs to the streams of Norton Sound. Reduction in food supply for immature salmon, while temporarily reducing growth, does not seem to be a permanent inhibiting factor; there

could be a small increase in predation on smolts. A worst case analysis is only performed when information is so insufficient that no reasonable choice among alternatives can be made. We believe we have sufficient information to reasonably assess the potential adverse effects on salmon.

Issue: Delay of adult migrations could affect spawning success.

Source: AVCP.

Response: Such delay would have to be over a period of several days as in the case of a physical stream barrier. There are no known instances where oil or other similar spilled liquid has blocked fish migrations to the detriment of spawning success.

Issue: Impacts of an oilspill on river fish are not analyzed.

Source: AVCP and Nunam Kitlutsisti.

Response: While it is known that some normally riverine fish species do at times inhabit coastal areas, their numbers were regarded to be small in relation to the total population and very unlikely to be impacted by oilspills.

Issue: Impacts on fisheries from exploration are not assessed.

Source: AVCP and Friends of the Earth.

Response: We assume that by exploration the commenters mean both geophysical surveys and exploratory drilling. Geophysical surveys have been conducted for some time without discernible environmental impacts, including surveys conducted in the Norton Basin. Based on offshore Alaska exploratory drilling we do not foresee any undue adverse environmental impacts from this activity.

Issue: If chronic pollution sufficient to kill or deter salmon from entering certain streams persists for a period of 5 years, most if not all of the salmon species indigenous to those streams will be eliminated.

Source: U.S. Fish and Wildlife Service.

Response: It is recognized that a major oilspill event could occur and contact a river mouth and that the initial concentrations of hydrocarbons in the water column may be sufficient to produce a toxic or avoidance response to migrating salmon (Sec. IV.B.2.b). The chronic discharge of hydrocarbons resulting from this event would not be expected to produce concentrations of hydrocarbons that would cause similar or significant responses to migrating salmon populations in subsequent years.

Issue: Table IV.B.2.b.-1 is inconsistent in that it shows interference with migration patterns, food supply, and toxic effects.

Source: U.S. Fish and Wildlife Service and AVCP.

Response: This table has been changed to correct these inconsistencies.

Issue: The DEIS indicates that the mortality of fish eggs and larvae from a spill would likely result only in the loss of single year class however, some populations may be made up of only one or a few year classes, and deletion of one could have a major effect.

Source: AVCP.

Response: This issue has been clarified in Section IV.B.2.b. in the FEIS.

Issue: The analysis of impacts on demersal fish does not consider indirect effects of an oilspill on food organisms.

Source: Marine Mammal Commission.

Response: Section IV.B.2.b has been expanded to more fully treat this consideration.

Issue: There is little use of scientific and technical literature in examining potential impacts on the area.

Source: Friends of the Earth.

Response: We believe adequate scientific and technical literature was used extensively to prepare this document. Please note the literature cited in the preparation of this document.

Issue: The DEIS did not include impacts on commercial fishing investments.

Source: Weaver Ivanoff.

Response: The significant fisheries economic information in testimony given by Mr. Ivanoff has been incorporated to this FEIS in Section IV.B.2.b.

Issue: The conclusion that sport hunting by industry personnel would have a relatively large effect on the abundance of biological resources in the Yukon River Delta is not justified, and would more likely be minimal.

Source: Sohio Alaska Petroleum Company.

Response: This issue has been reevaluated and changed in this FEIS to reflect the above viewpoint (see Sec. IV.B.2.a.).

Issue: Oil would pollute the seaweed that is important for herring spawning and would subsequently cause adverse impacts on higher organisms that prey on herring.

Source: Henry Ivanoff.

Response: Oil reaching herring spawning areas would indeed pollute the seaweed (rockweed and eelgrass) on which herring deposit their eggs, but it should be noted that: 1) while the major impact would be on that rockweed and eelgrass within the intertidal zone where most of the spawning occurs, some eggs are also deposited on plant and mineral substrates in deeper waters where

contact with oil is less likely; 2) with various groups of herring spawning over a period of several weeks, not all would be contacted by an oilspill; and 3) taking into consideration the lengthy expanse of coastline over which herring spawn, the low risk for oilspill contact, and the relatively short period when eggs and larvae would be susceptible to contact by oil, then the risk to herring is assessed as insignificant.

Issue: Much of the fisheries analysis in the DEIS is based on an exceedingly small data base.

Source: Marine Mammal Commission.

Response: The data base and analysis on fisheries presented in the DEIS has been expanded to present a more comprehensive treatment of the fishery resources (Sec. III.B) and potential impacts associated with the proposed lease sale (Sec. IV.B.2).

Issue: Any impact on the anadromous fishes of the Yukon could have international implications.

Source: AVCP.

Response: The analysis presented in the FEIS indicates minimal, if any, impact to the Yukon River anadromous fish resources, therefore, impacts to Canada are unlikely.

Issue: Direct effects on organisms are emphasized while indirect effects; i.e. through trophic systems, are underplayed.

Source: AVCP.

Response: Emphasis was placed on direct effects because in addition to being the most evident, they are of primary concern. This is not to infer or preclude that impacts on trophic systems are not important. However, the complexities involved are not well enough understood at this time for a more indepth analysis.

Issue: The disturbance and possible displacement of mammals and birds by tanker traffic, support vessels, and aircraft are underplayed.

Source: AVCP.

Response: The disturbance and possible displacement of birds and marine mammals was acknowledged and a measure to modify this occurence suggest in Section II.B.1.c.

Issue: The information presented on the effects of petroleum and oil and gas activities on the regional fisheries uses little of the very extensive literature on the subject.

Source: NOAA.

Response: The effects of oil and gas activites on regional fisheries has been documented by Terr et al. (1981) in "Western Alaska and Bering-Norton Petro-

leum Development Scenarios: Commercial Fishing Industry Analysis." Additionally, the effects of hydrocarbons on marine biota including fish has been documented by several sources in Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms (Volume I and II) edited by Malins (1977). Both these and other sources have been used in the evaluation of impacts on fish and fisheries (Sec. IV.B.2.b.) in this FEIS.

Issue: Undue emphasis is placed on relatively minor fishery resources; such as the king crab fishery.

Source: NOAA.

Response: While both catch and dollar value are low when compared with other Alaska fisheries, these fisheries are of considerable importance to the local inhabitants. With declines in the catch of king crab elsewhere, the small-scale Norton Sound fishery for this species could take on added importance.

Issue: Sockeye salmon are not listed in Table IV.B.2.b.-1 although they occur in the area.

Source: U.S. Fish and Wildlife Service.

Response: Because sockeye salmon inhabit, in relatively small numbers, only one system (Pilgrim River) in the area of concern, this species was omitted from the table. However, the Pilgrim River sockeye run is discussed in the text of this statement (Sec. IV.B.2.b.).

Issue: The DEIS does not mention the compatability between petroleum and fishing industries as evidenced by operations in the Gulf of Mexico. It is widely recognized that, if anything, the presence of offshore facilities enhances fish habitat.

Source: Texaco, Inc..

Response: Because of major differences in fish species and fishing operations, direct comparisons of operations in the Gulf of Mexico to the Bering Sea would be of little value to this analysis. Further, there is no evidence that any enhancement of fish habitat has occurred in Cook Inlet operations or exploratory drilling in the Gulf of Alaska. This is not to imply that it could not occur in the long-term in some areas of Alaska.

Issue: Migratory bird treaties and the wildlife refuge system preclude oil and gas activities.

Source: Nunam Kitlutsisti and AVCP.

Response: The bird treaties do not prohibit oil development or any other action that may or could adversely affect migratory birds. All of the treaties are concerned with regulations for taking migratory birds. The USSR-US treaty also concerns the identification and protection of important migratory bird habitats. Under this treaty the contracting parties are instructed to undertake the measures necessary to prevent and abate pollution or detrimental alteration of habitats identified to be of special importance. Government regulations and permits such as the USGS operating orders are

designed to provide for pollution prevention and abatement as required under the above treaty. The Yukon Delta National Wildlife Refuge and Clarence Rhode National Wildlife Refuge were established to conserve wildlife populations and protect important habitats of wildlife. However, the refuge system does not automatically prohibit any industrial activities from taking place within the refuges but directs that such activities, if they are allowed to take place, will not take preference over wildlife and habitat protection on the refuge.

Issue: The graphics depicting marine and coastal birds are inaccurate.

Source: Nunam Kitlutsisti and AVCP.

Response: The graphics in the descriptive section (Sec. III) are meant to portray resources most likely to be affected by the proposal. The fact that birds migrate over land as well as over the water has little to do with impacts of the proposal. Birds migrating over the water of Norton Sound may set down on an oil slick if a spill occurred in the sale area. Birds migrating several miles inland from the sale area would not come in contact with such a spill.

Issue: Marine birds may be attracted to oilspills as cited by Barry (1970).

Source: Eskimo Walrus Commission.

Response: We have read the report by Barry, 1970, and are aware of the vulnerability of birds to oilspills, especially in ice leads and other open water during the spring (see Sec. IV.B.2.c.).

Issue: The marine and coastal bird impact assessment conclusions are not consistent with scientific knowledge and the validity of the development scenario assumptions.

Source: AVCP.

Response: The conclusion of Section IV.B.2.c. of the proposed sale 57 FEIS is consistent with the best scientific data available on winds and currents and the chances of an oilspill contacting the Yukon Delta and inundating a large portion of that habitat. The development scenario indicated the Nome area as the site for onshore activities because it is the most economically feasible and practical location in the Norton Sound area for such a facility. The level of onshore activities and acreage (25-30 acres) would alter or destroy a minimal amount of coastal habitats.

There is always the possibility that an onshore facility site could be located on the Yukon Delta in the future. However, the lack of an existing infrastructure and the remoteness of the area would discourage any such plans in the near future. Furthermore, the water depth offshore of the Yukon Delta is too shallow for any kind of tanker terminal facility to be located there. If the state or the Calista Corporation leases areas adjacent to or on the Yukon Delta onshore facility, siting on the Delta is a strong possibility. The coastal area within approximately 3 miles of Sheldon Point north and east along the coast of the Yukon Delta is included in the State of Alaska's proposed sale 38 Area of Call which also includes the entire coast of Norton

Sound. Using the same level of onshore facility activity projected for Cape Nome (as described in the development scenario Sec. IV.A.2.) in establishing a similar scenario for a Yukon Delta onshore facility site (if it were feasible) could transfer approximately the same level of local biological impacts projected for Cape Nome to the Delta area. However, as stated on page 20 of the testimony, "the lease sale (Alaska's proposed sale No. 38) has only been proposed at this time and based upon the state's insistence that no tracts be leased within 12 miles of the Yukon Delta, it is very unlikely that a lease sale will actually take place there." The conclusion to Section IV.B.2.c. looks at proposed sale 57 activities independent of whatever state and Calista Native Corporation plans may be is a realistic prediction of the most likely level of impact on marine and coastal birds as a result of this proposal.

Issue: The cumulative effects analyses on marine birds is not an in-depth analysis.

Source: Whale Center.

Response: The analyses for the cumulative effects were based on the following: 1) effects of dredging and drilling muds on bird resources as a result of the proposal are likely to be insignificant, 2) enforcement of existing Alaska Fish and Game regulations should mitigate any illegal hunting problems, 3) human interferences or disturbance of bird resources is mentioned cumulatively, 4) the level of activities that may be associated with other proposed oil and gas leasing in the Norton sound and other planned projects in the area is essentially unknown at this time. Thus, the increased cumulative levels of disturbance cannot be quantified at this time or in the near future. Only a qualitative statement of the effects of future activity from other proposed or projected projects can be made at this time.

Issue: The EIS does not address the concern that oil trapped in ice does not weather and could be transported hundreds of miles from the spill source. This event could present a grave threat to extensive marine bird and mammal populations south of Norton Sound.

Source: Friends of the Earth

Response: Based on the oilspill trajectory analysis, there is a 51- to 60-percent chance that a 1,000 barrel or greater oilspill would be advected southward, out of Norton Sound, between St. Lawrence Island and the Yukon River Delta. The greater portion of this risk will be attributible to winter movement of spilled oil entrained in the pack ice. Such a frozen and therefore unweathered oilspill could reach the southern melting edge of the Bering Sea ice pack, thaw, and then spread. Because of prevailing winter currents, this hypothesized spill would most likely emerge from the ice pack far to the west or northwest of the Pribilof Islands. The spill would not likely reach land before it became weathered.

Potential impacts would be limited to seabirds and marine mammals. Winter seabird populations are somewhat higher along the ice front than elsewhere along the Bering Sea shelf (560 vs. 100 birds per square kilometer). The concentration factors along the ice front is not enough to risk an appreciable portion of the regional population. Potential impacts to Bering Sea marine

mammal populations from oil advected out of Norton Sound are described in Section IV.B.2.d. These impacts would be mitigated by the seasonal drilling stipulation described in Section II.B.1.c.

Issue: Distances between major bird colonies and the proposed sale area should be provided in the EIS.

Source: AOGA.

Response: This information is available from the references cited in the FEIS (see Sec. IV.B.2.c.). However, the distances between the colony sites and the lease area are not necessarily a direct function of the vulnerability of the various seabird concentrations. The major foraging areas shown on graphic 4A represent a more accurate perspective of distances between vulnerable seabird concentrations and the lease area.

Issue: Impacts on overwintering birds were only briefly discussed in the EIS.

Source: State of Alaska.

Response: Norton Sound proper has essentially no overwintering seabird populations. Polynyas and ice leads near St. Lawrence island are important to overwintering waterfowl (Sec. III.C.3.).

Issue: Probability of significant impacts on terrestrial mammals should be discussed in the EIS.

Source: State of Alaska.

Response: The level of onshore impacts that are likely to result from the proposal on terrestrial habitats is likely to be minimal (see exploration and development scenarios Sec. IV.A.1.2. and 3.). Hunting pressures are regulated by Alaska state fish and game management procedures which should prevent any possible overharvest as a result of population increases. It is unlikely that subsistence pressures on terrestrial mammals would significantly increase as a result of the proposal in response to significant impacts on marine mammals and bird resources (see Sec. IV.B.2.b.,c.,d., and e.). This issue was not identified in the scoping process as major concern, therefore it is only discussed briefly.

Issue: Certain aspects of the impact predictions related to marine mammals have a negative connotation.

Source: AOGA, and Exxon Company USA

Response: Comments were received that stated the DEIS was negative in regard to possible impacts and quoted DEIS, page 3, paragraph 4, sentence 3, as an example. Although it is certain that oil and gas development has very positive economic effects which are widely recognized, it does not follow that environmental effects are positive. The FEIS cannot avoid the apparent negative nature of this. It is not the intent of any EIS to simply portray negative conditions. This EIS tries to inform the Secretary of environmental effects potentially associated with an oil and gas leasing action. The con-

clusions summarized in that passage indicated that if spills were to occur during peak spring and fall migration, substantial adverse effects on marine mammals are possible. Such effects are undesirable and therefore negative. However, this conclusion was reached on the basis of available data of marine mammal distributions, potential oilspill effects, and oilspill risks to offshore habitats. The relevant statement (Sec. II.B.1.e.) has been revised structurally to improve clarity.

Issue: It is misleading to use "likely," "could result," and "not really predictable" to describe impacts on marine mammals and endangered species.

Source: AOGA.

Response: In reference to the section headed "Long-Term and Chronic Direct Effects," (Sec. IV.B.2.e.) the terms are used to indicate potential effects given certain circumstances. Section IV.A.4. distinguishes final (overall) from conditional probabilities of oilspill risks to certain areas. The statement conveys the following information: 1) large oilspills are unlikely; 2) if spills occur, there is a relatively high probability that they would move into offshore areas of great seasonal importance to marine mammals. The word "potentially" does not convey any particular level of probability except that such probability is greater than zero. We have attempted wherever possible to detail the nature and source of the various estimates of risks discussed in this analysis.

Issue: The significance of potential effects of gaseous hydrocarbons on marine mammals was overstated.

Source: AOGA.

Response: Potential effects of gas leaks are a remote possibility. It is stated in the EIS that such effects are relatively unlikely. To date, there is virtually no literature indicating that avoidance responses of marine mammals to oil and gas pollutants will be likely. Avoidance was discussed on pages 163-164 of the DEIS and identified the lack of information on behavioral response of marine mammals to oil or gas in the aquatic environment.

Issue: The DEIS has speculative statements regarding effects of geophysical activities on ringed seals.

Source: AOGA.

Response: Comprehensive studies regarding effects of geophysical exploration on ringed seals have not been completed. Preliminary findings of research performed in the spring of 1981 under contract to OCSEAP (RU 232), as well as other sources, indicate that such speculation is warranted and such effects possible. For that reason, research on that specific problem will be continuing (see Sec. IV.B.2.d.).

Issue: The methods of application of DEIS assumptions in predicting impacts on marine mammals are questionable.

Source: AOGA.

Response: The commenter suggested revision of the second sentence on page 183 of the DEIS which contains the phrase "assuming development as described in Section II.A." The section referenced contains a discussion of the expected numbers of spills which are likely to be associated with the proposal over the life of the field. For spills greater than 1,000 barrels, 2.8 are expected. This is a basic assumption of the EIS analysis, as stated in Section II.A.

Issue: Cumulative effects are likely to be insignificant since whales will not be in all sale areas simultaneously.

Source: AOGA.

Response: Although endangered whales may not be present in all proposed lease areas simultaneously, gray whales and bowhead whales may pass through many of the proposed Alaskan sale areas and other proposed west coast sale areas as well. There is no available information to suggest that simultaneous cumulative effects on whales would be more or less significant than sequential cumulative effects related to those sales. Either could be of significance cumulatively.

Issue: A worst case analysis should have been done to analyze the impacts on endangered whales.

Source: Friends of the Earth.

Response: Out staff has prepared an extensive analysis. Section IV.B.2.e. contains the available information relevant to the potential impacts on endangered whales which may occur as a result of this proposal. The biological opinion on endangered whales (Appendix G) contains a discussion of additional information needs and potential data gaps that may need to be filled in latter phases of the process.

As stated in this FEIS, certain information regarding potential effects are indeed lacking. Nevertheless, information regarding whales in the proposed sale 57 area and potential effects on those species was sufficient to allow appropiate risk comparisons among the alternatives. Therefore a worst case analysis was not necessary.

Issue: The DEIS should have addressed further the potential impacts on bowhead and gray whales, especially impacts regarding the bowhead whale in its winter range, fall migration, and spring migration.

Source: Friends of the Earth, NRDC, and Alaska Eskimo Whaling Commission.

Response: The EIS identifies the risk of spill movement toward endangered whale habitats and, with respect to migration routes (Sec. IV.B.2.a.). Movements of spills westward toward major bowhead migratory corridors may be somewhat more likely as indicated by a 17- to 23-percent chance of contact within 10 days for segments 27-29 (Appendix J, Table 15). Probability of spills moving west of 169° W. longitude and into major bowhead migratory corridors are probably lower, however, due to distance involved. Similarly, movement of spills to the southwest toward bowhead wintering areas is a 4- to

21-percent likelihood (Appendix J, Table 15, segments 31-33), and possibly higher in the unlikely situation that oil would be found in southern blocks (e.g., near locations P1, P2). Indirect impacts on the bowhead whales, as the result of spills associated with the proposal, are even less likely than those that may occur for gray whales since bowheads neither feed nor dwell in the immediate vicinity of the proposed sale for extended periods.

Issue: The DEIS should have addressed how effects on gray whales can be mitigated by the Yukon Delta sedimentation process.

Source: Friends of the Earth, NRDC, and Alaska Eskimo Whaling Commission.

Response: The FEIS has identified important gray whale concentration and feeding areas, and the relative risks of localized direct impacts to such areas. It is extremely unlikely that spills would lead to long-term change in sediment transport patterns, consequent potential change in bethic productivity or distribution patterns, and subsequent change in whale food availability. For that reason, discussion of sedimentation processes was not expanded in the impact section related to endangered whales.

4. Economic Consideration:

Issue: If conservation measures are initiated, then, the oil and gas resources from proposed sale 57 are not needed; therefore, the negative effects should be avoided by not holding the sale.

Source: David Marshall.

Response: Evaluation of the need for OCS oil development is a programmatic level evaluation of a policy nature. Such evaluation already has been performed several times (see the FEIS for the 5-year OCS program and Appendix H of the proposed sale 70 DEIS), resulting in the conclusion that other energy sources are not an alternative to federal oil and gas leasing under the existing energy crisis and national policy. Federal policy recognizes clearly that all sources are needed. The only practical short-term substitute for oil and gas development is importing. The energy crisis in the United States in brought about by the dependence on foreign oil imports. An increase in imports to substitute for U.S. oil and gas development would only compound the problem and should not be considered a substitute for such development. Oil development, particularly a single lease sale, is no direct substitue for (or cannot be substitued by) some other energy form.

Issue: Secondary impacts, such as housing shortages, may result in pressure for development in flood hazard areas.

Source: AK District Corps of Engineers.

Response: Development in flood hazard areas is unlikely due to existing land ownership patterns. Most of the land outside the townsite and along the floodways is owned by Alaska Gold Co. (ESL 1981a). This firm is unlikely to release their properties along the waterways for development. Much of the pressure for housing development is to fill short-term needs. Section IV.1.e. discusses a method proposed in the Nome CMP for accomodating this short-term

development pressure. In unmined areas near the city where mining is unlikely in the next 10 to 20 years, temporary modular housing could be developed on leased lots.

Issue: If onshore petroleum development at Prudhoe Bay has caused only minor increases in resident employment and population in the Barrow-North Slope census division, then the proposed sale 57 should have very little impact on resident employment and population in the Nome census division.

Sources: National Ocean Industries Association and Sohio Alaska Petroleum Company.

Response: The impacts of proposed sale 57 should not be estimated on the basis of the relatively insignificant resident employment and population impacts of onshore petroleum activity in the Barrow-North Slope census division. In the case of petroleum development within the North Slope census division, virtually all petroleum workers are located at Prudhoe Bay or other isolated enclaves not connected by road to any established nearby community. By contrast, it is expected that proposed sale 57 will result in construction of an industrial enclave about 10 miles from the present city limits of Nome and will be connected to Nome by road. As a result, it is expected that petroleum workers from the enclave will spend considerable time and money in Nome, thereby generating additional jobs in retail trade and services. In addition, those petroleum workers stationed on offshore rigs will pass through Nome on their way to and from recreational leave. These workers will also spend time and money in Nome, causing further increases in retail trade and services employment. All proposed sale 57 workers who commute out of the Nome area during recreational leave will help generate increased employment in air transportation.

Even more important, it is assumed that not all proposed sale 57 petroleum workers will be commuters. Roughly 10 percent are assumed to reside in the community and spend the major share of their income in the community. This is a key assumption of the analysis presented in this EIS, and this increase in personal consumption spending in Nome could not fail to create new jobs, not only in retail trade and services but in most other job categories too, including transportation, utilities, and communications. It must be recognized, however, that this is only an assumption and the analysis must be interpreted in that light. If, in fact, virtually all proposed sale 57 workers are commuters, the total economic and population impacts of proposed sale 57 will be very much less than indicated by the total employment and population impact figures presented in Tables IV.B.3.b.-1 through -5. Those persons who disagree with the projected total employment and population impact figures may disagree in part because they do not agree with the assumption that 10 percent of the proposed sale 57 workers will be residents of the community. These people could be correct in disagreeing with that assumption.

It should also be pointed out that because part of the resident workforce employed in proposed sale 57 activities will be new residents of the area, they will create an increased demand for government. For example, new residents will have children who will attend local schools, which will require more teachers.

There is one further qualification necessary regarding the total employment and population impact figures presented in this EIS. Recent investigation of the numbers of additional jobs generated by the indirect effects of natural resource development in rural Alaska which supports the view that the total employment and population impact figures produced by the University of Alaska SCIMP Model represents high end of the range of possible impacts. Revision of the SCIMP Model will incorportate these findings. It is expected that subsequent operations of the model will result in projections of indirect employment impacts which are perhaps only half as great, in proportion to the level of resource development employment, as the indirect employment impact figures presented in this FEIS (see Table IV.B.3.b.-1, Column 4). If this should prove to be the case, then the population impacts projected by future operations of the SCIMP Model will also be greatly reduced in proportion to a given amount of resource development employment.

One relevant conclusion, therefore, regarding the proposed sale 57 FEIS is that figures produced for this document by the SCIMP Model may possibly overstate by substantial amounts the indirect employment impacts of proposed sale 57 and the related increases in population. Even granting this, the fact remains that, if the assumption is correct that about 10 percent of the proposed sale 57 petroleum workers will be residents of the community rather than commuters, the total employment impacts and total population impacts on the city of Nome will be very large, in terms of percentage increases over the non-sale case. It must be remembered that the qualifications stated above regarding possible over-estimates of indirect employment impacts do not apply to the estimates of employment directly involved in proposed sale 57 petroleum activities. No information has been obtained subsequent to publication of the draft version of this EIS which has demonstrated any substantial error in the estimates of the numbers of workers who will be directly employed in onshore or offshore petroleum activity in the Nome area.

Furthermore, although the magnitude of certain types of impacts may be much less than indicated by the figures in Tables IV.B.3.b.-1 and IV.B.3.b.-2, none of the general conclusions presented in the economic impact analysis (Sec. IV.B.3.) are invalidated. If the assumption is correct that roughly 10-percent of the petroleum workers will be residents of the community rather than commuters, proposed sale 57 will certainly threaten a severe housing shortage and will certainly generate increased pressures for price inflation in Nome. On the positive side, there is little doubt that the sale will result in increased employment opportunities for permanent area residents, although the SCIMP Model projections may have over-estimated the extent of increased jobholding which will occur among long-term area residents.

Issue: Only negative economic impacts are discussed in the EIS; there is no mention of potential positive effects.

Sources: National Ocean Industries Association, and Sohio Alaska Petroleum Company.

Response: The economic effects of increased income and employment in the region are recognized by BLM. In the "Summary of Environmental Impact Statement" which appears at the very beginning of this FEIS, and in the "Conclusion" on impacts to the local economy (Sec. IV.B.3.b.) two positive points are made: 1) that the sale will almost certainly result in a significant increase

in jobholding by long-term residents of the Nome census division (this point is discussed in detail in the "Impacts" subsection of Sec. IV.B.3.b.), and 2) that the sale could result in local production and sale of natural gas, thereby reducing energy costs throughout the Nome census division.

Issue: Lengthy descriptions of the harmful nature of certain types of possible environmental consequences are presented, followed by a brief statement that the described impacts are extremely unlikely. This practice will give the casual reader a very mistaken impression of the likelihood of such impacts occurring.

Sources: National Ocean Industries Association and Sohio Alaska Petroleum Company.

Response: The negative environmental, economic, and social impacts expected if a substantial oilspill reached, for example, the Yukon Delta are discussed even though the probability of this occurring is estimated at slightly less than 0.2, based on available information. The discussion is necessary to demonstrate the seriousness of the possible impacts. The only alternative to this approach would be to ignore extremely serious possible consequences with relatively small probabilities, except in cases where the serious consequences could be explained in a few words. This alternative approach would not enable the EIS to perform its function of giving decisionmakers information about all of the important positive and negative impacts expected from a proposed sale, together with information about the chance of all important impacts occurring.

Issue: Besides the commercial fisheries of Norton Sound, the DEIS should also discuss the commercial fisheries of the Yukon River, and the subsistence use of fish by residents of the Norton Sound and Yukon River areas.

Source: AVCP

Response: The subsection entitled "Commercial Fishing Economic Base" is a portion of Section IV.D.2., entitled "Local Economy, Defined as the Economy of the Nome Census Division, with Emphasis on the City of Nome and Immediate Area." The commercial fisheries of the Yukon Delta and throughout the Yukon river were discussed earlier in Section IV.D.1. entitled "State and Regional Economies." The importance of subsistence fishing activities is described in the subsection "Other Economic Issues," as well as elsewhere in the economic section. In addition, an entire section (IV.B.2.b.) of the FEIS is devoted to impacts on fisheries resources. All of Section IV.B.1.c. is devoted to impacts on subsistence activities.

Issue: Many residents in the Norton Sound area have been economically disadvantaged by recent cutbacks in food stamps and welfare programs, and must now rely more on the commercial and subsistence use of fish, birds, and marine mammals, thus any possible damage to the wildlife resources has an even greater significance.

Source: Paul Abraham, Hilary Kairaenak, Peter Okitkun, Andrew Hunt Sr., Willie Senungetuk, Josephine Charlie, Henry Teeluk, Della Trader, Jack Williams, Mike Simon, Pete Kapanuk, Dana Kapanuk, Anna Kamkoff, Joseph Mike, and Issac Paul.

Response: Section III.D.1. describes in considerable detail the very heavy economic dependence of residents of the Yukon Delta area on the wildlife resources of the area, including fish, birds, and marine mammals which could be harmed by offshore petroleum activities. (See the last 5 paragraphs of this section.) The likelihood of harm to these resources is discussed in detail in Section IV.B.2. Further discussion of this topic is presented in Section IV.B.1.c.

Issue: Per capita personal income figures for 1979 which are now available from the U.S. Bureau of Economic Analysis were not included in the EIS.

Source: State of Alaska

Response: The more recent (1979) per capita personal income figures have been added to Table III.D.2.f.-2.

Issue: According to the survey of the U.S. Bureau of the Census the population count for the city of Nome was 2,301 for 1980, but the EIS presented a 1979 population figure of 3,204 for Nome and the immediately contiguous areas.

Source: State of Alaska

Response: The judgment of the Research and Analysis Section, Alaska Department of Labor, is that the 1980 census count in the Nome area is one of the few cases in which the 1980 census count was very seriously in error. The Research and Analysis Section is of the opinion that a 1979 population figure of 3,204 for Nome and the immediately contiguous areas is not seriously in error.

Issue: Assumptions and details of forecast methodology should be included as a part of the EIS.

Source: State of Alaska

Response: One of the disadvantages of using sophisticated computer models for the forecasting of employment and population impacts is that no simple description of forecast methodology can be provided. In the case of the University of Alaska's MAP and SCIMP models, an explanation of the forecasting methods is available only in the form of rather sizable documents. However, even these documents are now inaccurate due to very significant changes which have been made in the two models. For the most recent information about these models, or for information about the models at the time projections were prepared for the proposed sale 57 EIS, please contact the Institute of Social and Economic Research, University of Alaska.

Issue: Cost of living area differentials used in Table III.D.2.f.-1 are now out of date.

Source: State of Alaska

Response: The notes to Table III.D.2.f.-1 have been expanded to include the suggested warning about the use of the cost of living area differentials.

5. Coastal Zone Management:

Issue: Local coastal management programs should be completed before OCS activity commences.

Sources: State of Alaska, Kawarek, Inc., Unalakleet Native Corporation, AVCP, Bering Straits CRSA, NRDC, Kermit Kineakuk, Friends of the Earth, Sohio Alaska Petroleum Company, Paul Rookok, Frances Degnan, Lawrence Kayookluk, Harry Boone, Tim Towarak, Caleb Pungowiyi, Matthew Iya, Bob Blodgett, John Jemewouk, Rose Atuk, Robert Foote, Rural CAP, Roger Sillok, Diane Hemnes, Helga Eakon, Phillip Kuggeruk, John Kelly, Francis Thompson, Robert Okitkun, Peter Black, Ronald Brown, Andrew Kelley.

Response: Figure III.E.4.-1 depicts a time line for OCS activities and local coastal management program development. Timing of the programs is discussed in the accompanying text. Section IV.A.4. presents the impacts associated with the proposed sale and Alternative III, Delay of Sale. Alternative III impacts describe benefits which could be derived with additional time for planning. This analysis assumes that coastal management programs need not be completed prior to a lease sale but should be phased with the sequential nature of the OCS oil and gas development process.

Issue: The Department of Interior's Final Notice of Sale must be consistent with the Alaska Coastal Management Program (ACMP).

Source: State of Alaska.

Response: In accordance with 15 CFR 930, the Department of the Interior will examine its proposed action and make an assessment of pre-lease activities to determine if any of them have a direct effect on the coastal zone. This assessment will be made at the time the Proposed Notice of Sale is published (July 1982 for Norton Sound).

Issue: Limitations on Nome's ability to plan for OCS activity as a result of Nome's restricted jurisdiction and the probability of an enclave and other OCS related development occurring outside Nome's corporate boundary should be addressed in Section III of the EIS.

Source: Environmental Studies, Ltd.

Response: Limitations on Nome's ability to plan for OCS activity which occurs outside its corporate limits are addressed in both the descriptive and environmental consequence sections of the EIS (Secs. III.E.4.d., III.E.4.e., and IV.H.4.a.). These references also address the effects of Nome's new resurrected boundary. The uncertainty of what exact activities should be planned for is evident in the text. Even the enclave at Cape Nome used as the basis for analysis in the EIS is an assumption. Local delays in implementing land use controls may be an issue.

Issue: The section on Impacts on Coastal Managment offers no format for guiding coastal area uses if there were no coastal management plan (CMP).

Source: State of Alaska

Response: It was not considered appropriate to include options for local input in the absence of Coastal Managment Plans other than those already included in the text. It was noted in the discussion of the timing of the lease sale with local coastal management plans that for districts with no CMP's, the state can comment on the basis of impending CMP's. In fact, all local responses concerning proposed lease sales whether based on CMP's or local opinion are most effectively made through the Governor's Office (Section 19, Outer Continental Shelf Lands Act [OCSLA]). The value of making comments based on the CMP in lieu of other plans, is underscored in Section 608 of the OCSLA which specifically provides that the requirements of the Coastal Zone Management Act be followed. Moreover, unorganized boroughs lack planning capabilities outside the Coastal Management Program. Since other options would tend to be site specific, such as through the National Historic Preservation Act, or would likely rely on legislative or legal avenues rather than administrative ones, they were not considered appropriate for this section.

Issue: Because the Nome Coastal Management Plan (CMP) is a current expression of local land use planning, the CMP rather than the 1968 Comprehensive Plan should be the basis for discussion in the section on Land Status and Land Use for the City of Nome and vicinity.

Source: Environmental Studies, Ltd.

Response: The CMP contains policies relevant to both coastal planning and general land use planning. To ensure the relevance of the policies of the 1968 Comprehensive Plan to current planning policies, they were compared in Section III.E.5.b. to those of the CMP. All the issues cited in the FEIS as central to the Comprehensive Plan are also addressed in the CMP. This comparison verified the pertinence of the planning issues and included the policies of the CMP by reference.

Issue: A major element missing from the DEIS timeline on local coastal planning is federal approval of coastal management plans (CMP's) which can take from 1 month to 1 year.

Source: State of Alaska

Response: This information has been noted in footnote 2 of the timeline.

Issue: The relationship between coastal management plan (CMP) development and the lease sale schedule are inappropriate.

Source: AOGA and State of Alaska.

Response: The material was retained in the document as a statement of the relationship between coastal management plans and the federal OCS leasing program. Timing of CMP's is a critical element in mitigating impacts of OCS development. See the comment concerning the Delay of Sale because local CMP's are not yet complete (first issue in this section).

Issue: Changes in the coastal management plans of Nome, Bering Straits Coastal Resource Service Area (CSRA), Bethel, and the Yukon-Kuskokwim CRSA have occurred recently and should be included in the EIS.

Source: State of Alaska, Kawerak, Inc., AOGA, and Environmental Studies, Ltd.

Response: The new information has been included in Sections III.E.4. and IV.H.4. Discussion of Nome's Coastal Management Plan (CMP) was updated in light of the completed CMP draft published in July 1981. Bethel's CMP was included in the analysis and updates were made with respect to the Bering Straits and Yukon-Kuskokwim CRSA's.

6. Water Quality:

Issue: The DEIS does not provide estimates for formation waters or drilling mud volumes and the long-term impact of these pollutants on the endangered whales found in the lease area.

Source: Friends of the Earth.

Response: The FEIS has included discharge estimates for drilling muds and cuttings in Section IV.H.6.a. However, estimates for formation waters have not been provided. The estimates of formation water discharges for the Joint Beaufort Sea lease sale was possible based on strategraphic and structure characteristics from the adjacent onshore production wells at Prudoe Bay. Similar information for the Norton Sound region is not available at this time. The level of discharge would be dependent on a variety of reservoir characteristics and oils recovery practicies (such as water reinjection) which may change with time over the life of the field. Additionally, there is a wide range of historic discharge levels. For example, Prudhoe Bay discharges average less than 0.1 barrels of water per barrel of oil produced, while Cook Inlet discharges exceed 15 barrels per barrel of oil. The concern about the effects in general of formation waters on marine ecosystems and the Norton Sound area are discussed in Sections V.A. and IV.H.6 of this FEIS.

Issue: A suggestion was made that the following statement be included in the FEIS: "Evaluation of the discharge of dredge or fill material into waters of the United States will be included in follow-on environmental documents as required prior to any discharge. This study, in its current stage of development as a lease sale enviornmental evaluation, does not contain sufficient specification with regard to locations of disposal or fill sites to permit required evaluations. Specific locations and evaluations would be developed and presented in a environmental document prior to construction or development."

Source: U.S. Army Corps of Engineers.

Response: This suggested inclusion is certainly correct in its content; however, it was not added to the text of the FEIS because the reference made to the role of Section 404 of the Clean Water Act in Section IV.H.6.b. was judged sufficient to cover the intent of the suggested inclusion.

Issue: The conclusion drawn in the discussion of the discharge of drilling fluid and formation waters on the water quality and the adequacy of the NPDES permit program to accomodate these effluents should be factually supported to some degree in the FEIS, rather than simply referring to previous documents.

Source: State of Alaska.

Response: These issues were referred to other documents for the sake of brevity and to provide for a more readable document as required by CEQ regulation. The adequacy of the NPDES permit program, or any other state or federal regulatory function was considered outside the scope of assessment in this FEIS.

D. General Issues

Issue: The use of "moderate" in assessing sociocultural impacts needs additional explanation.

Sources: Norton Sound Health Corporation, Exxon Company USA., and Tim Towarak.

Response: Discussion of current and future sociocultural impacts in the Norton Sound proposed lease sale area needs to distinguish between base case and project OCS-related conditions. The assessment concludes that although base conditions in various social indicators (alcoholism, drug abuse, crime, mental health) are high, increases likely to occur with OCS development in the area are moderate. This assessment is based on socioeconomic and sociocultural studies performed for this FEIS and cited in Sections III.B.2. and IV.B.1.

Issue: Objection was taken to the reference to possible looting of archaeological sites by new residents of the area.

Source: Exxon Company, USA.

Response: The FEIS does not intend to imply that looting of archaeological sites would be a direct result of OCS personnel moving into the area, but rather that the probability of looting would increase as population increases.

Issue: Religious, traditional, hunting, fishing, archaeological or historical sites of religious value will not be cut off as stated in Section IV.H.1.

Source: Exxon Company, USA.

Response: The DEIS stated that access to historic, archaeological or religious sites may be cut off if land is leased for OCS development which contains these sites or is adjacent to these sites. In the FEIS, cut off has been changed to restricting free access to, which clarifies the meaning intended

Issue: The term "intrusion" in describing the wilderness qualities of Norton Sound, the Yukon Delta, and Seward Peninsula connotes inappropriate activity and should be replaced by "activity."

Source: AOGA.

Response: The word "intrusion" was replaced with the word "activities."

Issue: Reference to the Jesse Owens Games sponsored by ARCO should be included in the discussion of recreational resources of Nome for complete coverage of Nome's recreation opportunities.

Source: AOGA.

Response: Readers of the FEIS are referred to SESP Technical Report No. 53 for a complete discussion of recreational activities and facilities in Nome and its vicinity. This document provides the detailed elements of recreational activity in Nome, such as the Jesse Owens Games.

E. Public Hearings and Comments

Public hearings were held on the draft Environmental Impact Statement during the week of October 5, 1981 in Nome, Savoonga, Unalakleet, Kotlik, Emmonak, Bethel, and Anchorage, Alaska. A total of 152 persons testified at the public hearings. The following is a list of all persons who testified.

Nome Public Hearing

October 5, 1981

Name	Home/Affiliation
Gretchen Keizer	State of Alaska
Peter Hanley	Sohio Alaska Petroleum Compnay
Alton Wallik	Nome Eskimo Community
John Tetpon	Kawerak, Inc.
David Hite	ARCO Exploration Company
Caleb Pungowiki	Kawerak, Inc.
Othniel Oommittuk	Eskimo Walrus Commission
Joan M. Haig	Kawerak, Inc.
Matthew Iya	Eskimo Walrus Commission
Laura Kayoukluk	Kawerak, Inc.
John Garrison	Nome, AK
Robert R. Blodgett	Bering Straits Coastal Resource Service Area
Joe Kokochuruk	Kawerak Elders
Willie Senungetuk	Kawerak Committee
Margaret Suganna	Kawerak Committee
John Jemwouk	Kawerak, Inc.
Bill Dan	Norton Sound Health Corp.
Charles Johnson	Bering Straits Native Corp.
Rose Atuk	Nome, AK
Frances Degnan	Unalakleet, AK
Larry Chiklak	Kotlik, AK
George Krier	Nome, AK
Chuck Rivers	Hooper Bay High School
Tabela Napthias	Stebbins, AK
Jack U. Williams	Eskimo Whaling Commission
Julia O'Brien	Hooper Bay High School Student

Rachel Ireton	Rural CAP
Jonah Tokienna	Eskimo Walrus Commission
Carolyn Schubert	Anchorage, AK
Roger Silook	Gambell, AK
John Pullock	King Island Native Corp.
George I. Dann, Sr.	Stebbins, AK
Leora Kenick	Nome, AK
Henry Ivanoff	Unalakleet
Diane Hemnes	Bering Straits Coastal Resource Service Area
Gilbert Lockwood	St. Michael, AK
Clarence Irrigoo	Kawerak Elders Committee
Weaver Ivanoff	Norton Sound Fishing Corporation and Native Village Council of Unalakleet
Helga Eakon	Unalakleet Native Corporation
Dwight Milligrock	Bering Straits Coastal Resource Service Area
Phil Kugzruk, Jr.	Nome, AK
Sharon Walluk	Norton Sound Family Services
Zack William Barr	Shismarif, AK

Savoonga Public Hearing

October 5, 1981

Name	Home/Affliation
Paul Rooklak	Savoonga, AK
Joseph Iya	Savoonga, AK
Patrick A. Gologergen	Savoonga, AK
Cathy Noongwok	Savoonga, AK
Kermit Kineakuk	Savoonga, AK
Jeanette (Muffy) Iya	Savoonga, AK

Unalakleet Public Hearing

October 5, 1981

Name	Home/Affliation
Frances Degnan	Bering Straits Coastal Resouce Area Board
Pete Kutongan	Unalakleet, AK
Wasalie Eakon	Unalakleet, AK
Ada Degnan	Unalakleet, AK
Simer E. Seesak	Unalakleet, AK
Irene Katchatag	Unalakleet, AK
Allen Soosuk	Unalakleet, AK
Fredrick Katchatag	Unalakleet, AK
Susan Peterson	Unalakleet, AK
Lawrence Kayoukluk	Unalakleet, AK
Robert Foote	Unalakleet, AK
Jeanis Kautchak	Unalakleet, AK

Harry Boone	Bering Straits Coastal Resouce Area Board
Isiah Towarak	Unalakleet, AK
George Lockwood	Unalakleet, AK
Hannah Katongan	Unalakleet, AK
Tim Towarak	Unalakleet, AK
Helga Eakon	Unalakleet, AK

Emmonak Public Hearing

October 6, 1981

Name	Home/Affiliation
Frances Thompson	St. Mary's, AK
Phillip Foxie	Alaknauk Native Corp.
David Hite	ARCO Exploration Company
Axel Johnson	Emmonak Corp. Shareholders
Robert Okitkun	Kotlik Native Corp.
Tom Cook	Chevron USA
Felix Hess	Calista Corporation
Joe Agathluk	Emmonak, AK
Roy Hunt	Kotlik, AK
William Hopkins	Alaska Oil and Gas Association
Eugenia Yupanik	Emmonak, AK
Al Nakak (for John Hunt and Elmer Chemeek)	St. Michael, AK
Thomas Chikegak	Alakanak, AK
Harry Wilde, Sr.	Bering Straits Coastal Resource Service Area
Harold Nepoleon	Association of Village Council Presidents
Tom Brennan	Brennan and Brennan, Inc.
Mike Albert	Toksook Bay, AK
Nick Chanar	Toksook Bay, AK
Phillip Moses	Toksook Bay, AK
George Chimiugak	Toksook Bay, AK
Dick Bunyan	Hooper Bay, AK
Guy Mann	Hooper Bay, AK
Pete Kopanuk	Hooper Bay, AK
Mike Simon	Hooper Bay, AK
Raphael Murran	Hooper Bay, AK
Joseph Beans	Mountain Village, AK
Gregory Joe	Mountain Village, AK
Elmer Beans	Mountain Village, AK
Dana Kopanuk	Mountain Village, AK
Peter Black	Alakanuk, AK
Paul Phillip	Alakanuk, AK
John Hanson	Alakanuk, AK
Willie Moore	Emmonak, AK
Alfred Redfox	Emmonak, AK
Jasper Joseph	Emmonak, AK
Paul Redfox	Emmonak, AK
Jimmy Yupnik	Emmonak, AK

Ignatiour Murphy	Sheldon Point, AK
Josephine Charlie	Sheldon Point, AK
Catherine Buster	Alakanuk, AK
Camille Joseph	Alakanuk, AK
Zavier Joseph (Sonny)	Alakanuk, AK
Regena Andrews	Kotlik, AK
Cecilia Foxie	Kotlik, AK
Mildred Unok	Kotlik, AK
Agnes Teeluk	Kotlik, AK
Alma Keyes	Kotlik, AK
Anna Kamkoff	Kotlik, AK
Edward Adams	Sheldon Point, AK
Rose Prince	Sheldon Point, AK
Joseph Mike	Kotlik, AK
Mark Okitkun	Kotlik, AK
Jeff Bender	Kotlik, AK
Rudolph Williams	Kotlik, AK
Henry Teeluk	Kotlik, AK
Joseph Aparezuk	Kotlik, AK
Dorothy Kameroff	Emmonak, AK
Rose Barkowski	Emmonak, AK
Theresa Peoples	Stebbins, AK
Robert D. Wolfe	University of Southern California
Charles Harry, Sr.	Alakanuk, AK
Isaac Paul	Napakiak, AK
Vicotr Tonuchuk	Kotlik, AK
Josie Kamkoff	Kotlik, AK
Ronald Brown	Kotlik, AK
Jeannie Waska	Kotlik, AK
Andrew Kelly	Emmonak, AK
Robert Moore	Emmonak, AK
Della Trader	Emmonak, AK
Franklin Murphy	Emmonak, AK
John Kelly	Emmonak, AK
Evan Uisok	Emmonak, AK
Harold Sparck	Nunam Kitlutsisti

Kotlik Public Hearing

October 6, 1981

Name	Home/Affilation
Peter Okitkum	Kotlik, AK
Gabriel Yunak	Kotlik, AK
Andrew Hunt, Sr.	Kotlik, AK
Theresa Tonuchuk	Kotlik, AK
Lawrence Chugach	Kotlik, AK
Sarah Cheewok	Kotlik, AK

Bethel Public Hearing

October 6, 1981

Name	Home/Affiliation
David Nanalook	Togiak, AK
Stan Maxie	Napaskiak, AK
Henry Nanalook	Togiak, AK
Hilary Kairainak	Chefornak, AK
Paul Abraham	Chefornak, AK

Anchorage Public Hearing

October 8, 1981

Name	Home/Affiliation
David Benton	Friends of the Earth
Bruce Clardy	Sohio Alaska Petroleum Company
Charles Matthews	National Ocean Industries
Paul Kelly	National Ocean Industries
C.V. "Chat" Chatterson	National Ocean Industries
Kenneth R. Hamm	Nunam Kitlutsisti
Anthony Vaska	Alaska Representative from Bethel
Jim Kawalsky	Tanana Chiefs Conference, Inc.
Lonnie Brooks	International Association of Geophysical Contractors
William M. Myers	Alaska Oil and Gas Association
Dr. T. D. Ralston	Alaska Oil and Gas Association
Lenord A. Darsow	Alaska Oil and Gas Association
Dan Thomas	Anchorage, AK
Thomas Jumbo	Nightmute, AK
Lee V. Gefvert	Alaska Oil and Gas Association
Charles H. Baskin	Alaska Oil and Gas Association
D. C. Hartman	Texaco, Inc.
Phillip Holt, Jr.	Chugiak, AK

Public Comments: Public comments were received from 41 sources, including government organizations, industry, and individuals. Several comments were recieved well beyond the stated time period for comments on the DEIS (October 16, 1981). Although every effort has been made to answer all comments, unavoidable factors, such as printing schedules, prevented late comments from obtaining the same consideration as those timely comments. The following is a list of the 41 sources of comments. (See Appendix L.) The comments which were submitted late (commenters are indicated by an asterisk (*)) are not reproduced in the FEIS. They are available for inspection at the Alaska OCS Office.

Government

Federal

Nuclear Regulatory Commission	David Muller

Department of Agriculture	
Forest Service	Michael A. Barton
Department of the Army	
Alaska District Corps of Engineers	Harlan E. Moore
Department of Commerce	
*National Oceanic and Atmospheric Administration	Robert L. Mike
Department of the Interior	
Bureau of Mines	James Paone
Fish and Wildlife Service	Assistant Regional Director
Geological Survey	Eddie Ruyatt
*Bureau of Indian Affairs	Kenneth J. Fredericks
*Federal Energy Regulatory Commission	Kenneth A. Williams
*Marine Mammal Commission	R. J. Hofman, Ph.D
State of Alaska	
Department of Labor	Edmund N. Orbuck
*Department of Transportation and Public Facilities	Jonathan A. Widdis
Office of the Governor	James M. Souby
Local	
Alakanuk Native Corporation	
Association of Village Council Presidents	Harold Napoleon President
City of Teller	Morris Kugzruk
Organizations	
Alaska Eskimo Whaling Commission	S. Lynn Sutcliffe, Counsel to the AEWC
ARCO Alaska	G. L. Wilkinson
Alaska Oil and Gas Association	William W. Hopkins
Bering Srait Coastal Resource Service Area Board	Diane Hemnes
Environmental Services, LTD	Dick Myluis
Exxon USA	
Friends of the Earth	David Benton Marine Resources Specialist

Getty Oil Company	E. E. Lilly
Liskow and Lewis, Attorneys at Law for the Alaska Oil and Gas Association	William M. Meyers
Maniilag Association	Fred Wemok, Executive Vice-President
Natural Resources Defense Council, Inc.	Liza Carter
Nunam Kitlutsisti	Ken Hamm
Sohio Petroleum Comapny	Bruce Clardy
Tanana Chiefs Conference, Inc.	Jim Kowalsky
Texaco, Inc.	Donald C. Hartman
Unalakleet Native Corporation	Helga Eakon
Whale Center	Pamela Ferris-Olson

Individuals

Sue Comis	Anchorage, AK
Wendy Elder	Anchorage, AK
Charles Harry, Sr.	Alakanuk, AK
Roy D. Iutzi Johnson	Nome, AK
David Marshall	Aniak, AK
Della Trader	Emmonak, AK
William Trader	Emmonak, AK

VI

CONSULTATION

AND

COORDINATION

VI. CONSULTATION AND COORDINATION

A. Contributing Authors and Supporting Staff Members

Ralph V. Ainger, Washington Project Officer for Sale 57
Bureau of Land Management
Lawrence V. Albert, Community Planner
George H. Allen, Regional Planner
Marsha E. Bennett, Sociologist
Betty J. Bonner, Secretary
Thomas H. Boyd, Fisheries Biologist
Victoria L. Breukelman, Travel
Phyllis J. Casey, Program Analyst
Cleveland J. Cowles, Wildlife Biologist
Raymond R. Emerson, Supervisory Environmental Protection Specialist
Linda M. Gaudreau, Social Science Analyst
L. Jane Glynn, Visual Information Specialist
Judith C. Gottlieb, Chief, Division of Environmental Assessment
Linda Hailey, Librarian
Sylvia K. Hale, Supervisory Clerical Assistant
Donald J. Hansen, Wildlife Biologist
Jonelle G. Hansen, Clerk Typist
Jack R. Heesch, Socioeconomic Specialist
Nancy K. Hendrix, Technical Information Specialist
Bonnie M. Hepburn, Computer Systems Analyst
Debbie Jo Hogan, Lead Clerk
Phillip J. Manke, Cartographic Technician
Roger Marks, Economist
Judy L. McComb, Clerk Typist
Maureen McCrea, Social Science Analyst
Robert M. Meyer, Program Analyst
Thomas K. Newbury, Oceanographer
Debbie L. Oakes, Clerk Typist
Elaine C. Pratt, Technical Information Specialist
Richard L. Prentki, Oceanographer
Dwayne A. Richardson, Cartographic Technician
Richard W. Roberts, Oceanographer
Ronald C. Scheidt, Oceanographer
Helen C. Schneider, Clerk Typist
Gilbert G. Springer, Oceanographer
James W. Sullivan, Economist
Tom B. Swan, Mail and File Clerk
Jean E. Thomas, Illustrator
Evert E. Tornfelt, Social Science Analyst
Kay V. Tracy, Writer/Editor
John D. Tremont, Environmental Specialist
Robert J. Wienhold, Fisheries Biologist
Laura J. Yoesting, Technical Information Specialist

B. Development of the Proposal

Proposed OCS sale No. 57 is one of 36 proposed OCS sales included in the 1980 5-Year OCS Oil and Gas Leasing Schedule. Coordination with other governmental agencies, industry, and the public regarding this proposal began in December 1978.

At that time, BLM requested resource reports from all Federal agencies with expertise pertinent to the proposal and the proposed sale area. Next, on April 30, 1979, a Call for Nominations and comments was issued, requesting expressions of industry interest in tracts within the call area and requesting comments on environmental issues related to oil and gas leasing in the area. Responses were received from 11 companies and numerous state and Federal agencies, conservation groups, and individuals.

Following evaluation of the tract nominations and environmental information received in the process described above, BLM and GS submitted a joint recommendation for tract selection to the Secretary. On February 20, 1980, the Department announced the selection of 429 blocks for further environmental study. (See Section I.A. for more detail.)

C. Development of the DEIS

During preparation of the DEIS, federal, state, and local agencies, industry, and the public have been consulted in order to obtain descriptive information, to identify significant impacts and issues, and to identify effective mitigating measures and reasonable alternatives to the proposal (described in Section A above) were used in preparation of the DEIS. In addition, scoping meetings were held following tract selection, with Federal, state, and local agencies, and the public in order to identify more clearly and specifically issues and alternatives to be studied in the DEIS. A list of scoping meetings can be found in Section D below. A more complete description of the scoping process and its results can be found in Appendix H.

Departmental Manual Part 655 DM 1 details procedures for intradepartmental coordination regarding OCS oil and gas leasing. Departmental agencies with interest and expertise in the OCS were consulted, in accordance with these procedures, during the development of the lease stipulations for this proposal (Sec. II.B.1.b.)

D. Scoping Process for Sale 57 - Proposal and Alternatives

The scoping process for proposed lease sale 57 consisted of the following meetings conducted by members of the Alaska OCS Office with members of the U.S. Geological Survey, Conservation Division, participating.

1. Nome, Alaska:

a. Meeting with the King Island Eskimos, King Island Hall, March 10, 1980.

b. Meeting for the general public, Nome Elementary School, March 10, 1980.

c. Meeting with Mayor Leo Rasmussen and the Nome City Council, City Hall, March 11, 1980.

d. Meeting with representatives from Kawerak, Inc., Nome Eskimo Community, Sitnasuak Native Corporation, residents of Nome, and village representatives from Shishmaref, Wales, Brevig Mission, Teller, Savoonga, and Gambell. The meeting was held in King Island Hall on March 11, 1980.

e. Participation by representatives of the Alaska OCS Office at the Elders' Conference on April 3, 1980. Elders from the villages of the Bering Straits Native Corporation (Nome and 16 villages) attended.

2. Unalakleet, Alaska: A public meeting was held March 12, 1980, at the Bureau of Indian Affairs (BIA) school with residents of Unalakleet and village representatives from Koyuk and Shaktoolik.

3. Golovin, Alaska: A meeting was held with residents of Golovin on March 13, 1980, at the Community Building. A representative of the village of White Mountain also attended.

4. Alakanuk, Alaska: Representatives of the Alaska OCS Office and U.S. Geological Survey, Conservation Division, were invited to attend a 3-day Special Convention hosted by the Association of Village Council Presidents (AVCP) in the village of Alakanuk in the Yukon River Delta from March 25 through March 27, 1980. Representatives from over half of the 56 villages of the Calista Corporation were present. Presentations were made by members of the Alaska OCS Office and USGS with a scoping workshop conducted on the second day of the convention.

5. Stebbins, Alaska: A meeting was held in the village offices on April 4, 1980. Two representatives from Golovin attended this meeting as well as residents of Stebbins.

6. Anchorage, Alaska:

a. Meeting with the Alaska Regional Technical Working Group Committee, Intergovernmental Planning Program (IPP) on April 2, 1980.

b. Meeting at the Center for the Environment on April 9, 1980.

c. Meeting with representatives from Federal and state agencies, Michael Building, April 15, 1980.

d. Public meeting at Central Junior High School on April 16, 1980.

7. Juneau, Alaska: Meeting with the general public, as well as representatives from Federal and state agencies on April 23, 1980.

The scoping process did not consist of only the 14 meetings listed above. Public participation was an ongoing process since the leasing proposal began with the Call for Nominations in April 1979. As time and budgetary restrictions permitted, the Alaska OCS Office responded to the requests of various groups for both the Calista and Bering Straits regions to participate in

public meetings to disseminate information and gather scoping input for the environmental statement. For example, various staff members have participated as invited guests at Coastal Resource Service Area Board Meetings for both the Calista and Bering Straits regions of Norton Sound.

The letter campaign to encourage participation at scoping meetings and/or elicit written comments was extensive and consisted of 56 letters to Federal and state agencies, 38 letters to special interest groups, as well as 145 letters to village governments and village councils of the Calista region.

Refer to Section I.F. for the summary of scoping results as well as Appendix H for a detailed discussion of the Norton Sound scoping process.

E. List of Contacts for Preparation and Review of the Environmental Impact Statement (EIS)

Federal, state, and local government agencies, academic institutions, industrial firms, special interest groups, and private citizens, were consulted prior to and during the preparation of this environmental impact statement. Agencies, groups, and individuals contacted for information as well as review of the DEIS are included in, but not limited to, the following list:

Federal Agencies
Department of Agriculture
- Forest Service

Department of Commerce
- National Marine Fisheries Service
- National Oceanic and Atmospheric Administration
- Office of Coastal Zone Management
- Office of Ecological and Environmental Conservation
- OCSEAP Office, Juneau

Department of Defense
- Air Force
- Army Corps of Engineers
- Department of the Army
- Naval Operations

Department of Energy
- Alaska Field Office
- Economic Regulatory Administration
- Federal Energy Regulation Commission
- Leasing Policy Development

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management, State Director
- Bureau of Mines
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Office of Aircraft Services

Special Assistant to the Secretary

Department of Transportation
    Coast Guard
Department of the Treasury
Environmental Protection Agency

State of Alaska
The Honorable Jay S. Hammond, Governor
Department of Administration
Department of Commerce and Economic Development
Department of Community and Regional Affairs
Department of Environmental Conservation
Department of Fish and Game
Department of Health and Social Services
Department of Labor
Department of Law
Department of Natural Resources
Department of Public Works
Department of Revenue
Department of Transportation and Public Facilities
Office of Coastal Management
Office of the Governor
    Division of Policy Development and Planning,
    State-Federal Coordinator

Universities
University of Alaska
    Marine Advisory Program
Washington State University
    Department of Sociology

Local Government
Association of Village Council Presidents City, Village, Traditional and/or IRA Councils for the following communities:

Akiachak	Mekoryuk
Akiak	Mountain Village
Alakanuk	Napakiak
Aniak	Napaskiak
Andreafsky Townsite	Newton
Apnautluak	Nightmute
Bethel	Nome
Chuathbaluk	Oscarville
Chefornak	Quinhagak
Chevak	Pilot Station
Crooked Creek	Pitkas Point
Eek	Platinum
Emmonak	Red Devil
Goodnews Bay	Russian Mission
Georgetown	Scammon Bay
Hooper Bay	Sheldon Point
Kasigluk	Sleetmute
Kipnuk	St. Marys
Kongiganak	Stony River

Kotlik
Kwethluk
Kwigillingok
Lime Village
Lower Kalskag
Marshall
Nome, Alaska
Leo Rasmussen, Mayor
Andy Edge, City Manager
Ivan Widom, City Manager
Teller
Toksook Bay
Tuluksak
Tuntutuliak
Tununak
Upper Kalskag

Native Organizations
Bering Straits Native Corporation
Calista Corporation
Kawerak, Inc.
Nome Eskimo Community
Nunam Kitlutsisti
Sitnasuak Native Corporation
Unalakleet Native Corporation

Special Interest Groups
Acoustical Society of America
Alaska Center for the Environment
Alaska Conservation Society
Alaska Geological Society, Inc.
Alaska League of Women Voters
Alaska Miners Association
Alaska Oil and Gas Association
Alaska Professional Hunters Association
Alaska Public Interest Res. Group
Alaska Wildlife Federation and Sportman's Council, Inc.
Audubon Society, Anchorage Chapter and National Representative
Bertha's Brokerage
Chugach Gem and Mineral Society
Environmental Center, West Anchorage High School
Friends of the Earth
Geophysical Society of Alaska
Greenpeace Alaska
Isaac Walton League of America
Moening-Grey and Assoc., Inc.
Resource Development Council
Rural CAP
Sierra Club
Trustees for Alaska
Wilderness Society

Villages Represented
Brevig Mission
Elim
Gambell
Golovin
King Island
Koyuk

Little Diomede
Savoonga
Shishmaref
St. Michael
Stebbins
Teller
Unalakleet
Wales
White Mountain

Additional Contacts
Rick Blodgett (Mr. and Mrs.)
Norman Cohen
Helga Eakon
Larry Fagerstrom
Linda Ryan Fagerstrom
M. Hayes
Chuck Hunt
Francis Hunt
Gordon Iya
Willy Kamkoff
John Kelly
Emmanual Keyes (Mr. and Mrs.)
John Killigzruk
Morris Kuzruk
David Mike (Mrs.)
Joseph Mike (Mr. and Mrs.)
R. Muench
Rev. and Mrs. Noedler
William & Margaret Odinzoff
Agnes Okitkun
Henry Teeluk
Flora and Rudolf Williams
Rosita Worl

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BIBLIOGRAPHY

Numerous entries in the following Bibliography refer to a recent publication entitled The Eastern Bering Sea Shelf: Oceanography and Resources, which was prepared for the Department of the Interior through the Outer Continental Shelf Environmental Assessment Program (OCSEAP), Office of Marine Pollution Assessment (OMPA), Department of Commerce. The publication has been listed in this Bibliography by various contributing principal investigators, as well as the editors. Although many EIS authors cited preliminary drafts of the document, it was recently published and can now be obtained through the OCSEAP Alaska Office, P.O. Box 1808, Juneau, Alaska 99802.

For clarity in this EIS, the various entries in the following Bibliography that refer to the document are marked with an asterisk (*).

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APPENDICES

APPENDIX A

LIST OF BLOCKS COMPRISING THE PROPOSED ACTION, INCLUDING DISTANCE FROM SHORE, WATER DEPTH, AND SIZE

Prepared by
The Alaska OCS Office

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-1	25	2304.00	5693.18	21	38
	26	2304.00	5693.18	20	36
	27	2304.00	5693.18	19	37
	28	2304.00	5693.18	19	36
	29	2304.00	5693.18	19	35
	30	2304.00	5693.18	18	34
	31	2304.00	5693.18	18	34
	32	2304.00	5693.18	18	33
	71	2304.00	5693.18	19	39
	72	2304.00	5693.18	19	38
	73	2304.00	5693.18	19	37
	74	2304.00	5693.18	18	37
	75	2304.00	5693.18	18	36
	76	2304.00	5693.18	18	36
	115	2304.00	5693.18	20	42
	116	2304.00	5693.18	19	41
	117	2304.00	5693.18	19	40
	118	2304.00	5693.18	18	40
	119	2304.00	5693.18	18	40
	120	2304.00	5693.18	17	39
	159	2304.00	5693.18	20	44
	160	2304.00	5693.18	19	43
	161	2304.00	5693.18	19	42
	162	2304.00	5693.18	18	42
	163	2304.00	5693.18	17	42
	164	2304.00	5693.18	17	41
	203	2304.00	5693.18	21	47
	204	2304.00	5693.18	19	47
	205	2304.00	5693.18	19	46
	206	2304.00	5693.18	18	45
	207	2304.00	5693.18	17	44
	208	2304.00	5693.18	17	42
	245	2304.00	5693.18	22	55
	247	2304.00	5693.18	21	50
	248	2304.00	5693.18	19	48
	249	2304.00	5693.18	18	46
	250	2304.00	5693.18	18	44
	251	2304.00	5693.18	17	42
	252	2304.00	5693.18	17	41
	288	2304.00	5693.18	24	55
	289	2304.00	5693.18	23	52
	290	2304.00	5693.18	22	50
	291	2304.00	5693.18	21	48
	292	2304.00	5693.18	19	46
	293	2304.00	5693.18	18	44
	294	2304.00	5693.18	17	42
	295	2304.00	5693.18	17	40
	296	2304.00	5693.18	17	38

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-1	332	2304.00	5693.18	24	54
	333	2304.00	5693.18	23	51
	334	2304.00	5693.18	22	48
	335	2304.00	5693.18	21	46
	336	2304.00	5693.18	20	44
	337	2304.00	5693.18	19	42
	338	2304.00	5693.18	17	40
	339	2304.00	5693.18	17	38
	340	2304.00	5693.18	16	36
	375	2304.00	5693.18	25	54
	376	2304.00	5693.18	24	52
	377	2304.00	5693.18	23	48
	378	2304.00	5693.18	22	46
	379	2304.00	5693.18	21	45
	380	2304.00	5693.18	20	42
	381	2304.00	5693.18	19	40
	382	2304.00	5693.18	18	38
	383	2304.00	5693.18	17	36
	419	2304.00	5693.18	25	52
	420	2304.00	5693.18	24	50
	421	2304.00	5693.18	23	48
	422	2304.00	5693.18	22	45
	423	2304.00	5693.18	21	42
	424	2304.00	5693.18	21	40
	425	2304.00	5693.18	19	38
	426	2304.00	5693.18	18	36
	427	2304.00	5693.18	16	34
	464	2304.00	5693.18	24	48
	465	2304.00	5693.18	23	46
	466	2304.00	5693.18	23	44
	467	2304.00	5693.18	22	41
	468	2304.00	5693.18	21	38
	469	2304.00	5693.18	18	36
	470	2304.00	5693.18	17	34
	471	2304.00	5693.18	14	32
	499	2304.00	5693.18	27	58
	510	2304.00	5693.18	23	41
	511	2304.00	5693.18	22	39
	512	2304.00	5693.18	21	37
	513	2304.00	5693.18	18	34
	514	2304.00	5693.18	16	32
	515	2304.00	5693.18	12	30
	543	2304.00	5693.18	27	59
	544	2304.00	5693.18	26	62
	545	2304.00	5693.18	26	62
	554	2304.00	5693.18	23	40
	555	2304.00	5693.18	22	38
	556	2304.00	5693.18	21	35

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-1	557	2304.00	5693.18	18	33
	558	2304.00	5693.18	14	30
	559	2304.00	5693.18	12	28
	587	2304.00	5693.18	27	59
	588	2304.00	5693.18	26	62
	589	2304.00	5693.18	26	60
	597	2304.00	5693.18	23	40
	598	2304.00	5693.18	23	38
	599	2304.00	5693.18	22	36
	600	2304.00	5693.18	20	34
	601	2304.00	5693.18	18	31
	602	2304.00	5693.18	14	28
	603	2304.00	5693.18	11	26
	604	2304.00	5693.18	10	24
	631	2304.00	5693.18	26	58
	632	2304.00	5693.18	26	62
	633	2304.00	5693.18	25	59
	634	2304.00	5693.18	25	57
	635	2304.00	5693.18	24	54
	636	2304.00	5693.18	24	52
	640	2304.00	5693.18	23	42
	641	2304.00	5693.18	23	39
	642	2304.00	5693.18	22	37
	643	2304.00	5693.18	22	34
	644	2304.00	5693.18	20	32
	645	2304.00	5693.18	18	30
	646	2304.00	5693.18	14	27
	647	2304.00	5693.18	11	24
	675	2304.00	5693.18	26	58
	676	2304.00	5693.18	25	59
	678	2304.00	5693.18	24	55
	679	2304.00	5693.18	24	53
	680	2304.00	5693.18	23	50
	681	2304.00	5693.18	23	48
	682	2304.00	5693.18	23	45
	684	2304.00	5693.18	23	40
	685	2304.00	5693.18	22	38
	686	2304.00	5693.18	22	36
	687	2304.00	5693.18	21	33
	688	2304.00	5693.18	20	30
	689	2304.00	5693.18	18	28
	690	2304.00	5693.18	15	26
	691	2304.00	5693.18	11	24
	722	2304.00	5693.18	23	54
	723	2304.00	5693.18	23	52
	724	2304.00	5693.18	23	49
	728	2304.00	5693.18	22	39
	729	2304.00	5693.18	22	37

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-1	730	2304.00	5693.18	22	34
	731	2304.00	5693.18	21	31
	732	2304.00	5693.18	20	29
	733	2304.00	5693.18	17	27
	734	2304.00	5693.18	15	23
	735	2304.00	5693.18	11	20
	766	2304.00	5693.18	23	53
	767	2304.00	5693.18	23	50
	768	2304.00	5693.18	23	48
	772	2304.00	5693.18	21	38
	773	2304.00	5693.18	21	35
	774	2304.00	5693.18	21	33
	775	2304.00	5693.18	20	30
	776	2304.00	5693.18	19	28
NP 3-2	1	2304.00	5693.18	18	34
	2	2304.00	5693.18	18	34
	3	2304.00	5693.18	18	34
	4	2304.00	5693.18	18	34
	5	2304.00	5693.18	18	34
	6	2304.00	5693.18	17	35
	7	2304.00	5693.18	17	35
	8	2304.00	5693.18	17	38
	9	2304.00	5693.18	17	39
	10	2304.00	5693.18	17	40
	11	2304.00	5693.18	17	39
	12	2304.00	5693.18	17	38
	13	2304.00	5693.18	18	35
	14	2304.00	5693.18	18	34
	15	2304.00	5693.18	18	33
	16	2304.00	5693.18	18	32
	17	2304.00	5693.18	18	31
	45	2304.00	5693.18	17	36
	46	2304.00	5693.18	17	36
	47	2304.00	5693.18	17	37
	48	2304.00	5693.18	17	38
	49	2304.00	5693.18	16	38
	50	2304.00	5693.18	16	38
	51	2304.00	5693.18	16	39
	52	2304.00	5693.18	17	40
	53	2304.00	5693.18	17	42
	54	2304.00	5693.18	17	45
	55	2304.00	5693.18	17	46
	56	2304.00	5693.18	17	40
	57	2304.00	5693.18	17	38
	58	2304.00	5693.18	17	36
	59	2304.00	5693.18	17	35
	60	2304.00	5693.18	17	32
	61	2304.00	5693.18	17	30

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-2	62	2304.00	5693.18	17	28
	89	2304.00	5693.18	17	39
	90	2304.00	5693.18	17	39
	91	2304.00	5693.18	17	40
	92	2304.00	5693.18	17	40
	93	2304.00	5693.18	16	40
	94	2304.00	5693.18	16	41
	95	2304.00	5693.18	16	41
	96	2304.00	5693.18	16	40
	97	2304.00	5693.18	16	40
	98	2304.00	5693.18	16	40
	99	2304.00	5693.18	17	40
	100	2304.00	5693.18	17	40
	101	2304.00	5693.18	17	38
	102	2304.00	5693.18	17	35
	103	2304.00	5693.18	17	33
	104	2304.00	5693.18	17	30
	105	2304.00	5693.18	17	27
	106	2304.00	5693.18	17	24
	133	2304.00	5693.18	17	42
	134	2304.00	5693.18	17	42
	135	2304.00	5693.18	16	42
	136	2304.00	5693.18	16	41
	137	2304.00	5693.18	16	40
	138	2304.00	5693.18	16	39
	139	2304.00	5693.18	16	38
	140	2304.00	5693.18	16	38
	141	2304.00	5693.18	16	36
	142	2304.00	5693.18	16	38
	143	2304.00	5693.18	16	38
	144	2304.00	5693.18	16	38
	145	2304.00	5693.18	16	37
	146	2304.00	5693.18	16	34
	147	2304.00	5693.18	16	32
	148	2304.00	5693.18	17	28
	149	2304.00	5693.18	17	26
	150	2304.00	5693.18	17	24
	177	2304.00	5693.18	17	42
	178	2304.00	5693.18	17	40
	179	2304.00	5693.18	16	40
	180	2304.00	5693.18	16	39
	181	2304.00	5693.18	16	38
	182	2304.00	5693.18	16	36
	183	2304.00	5693.18	16	35
	184	2304.00	5693.18	16	35
	185	2304.00	5693.18	16	35
	186	2304.00	5693.18	16	35
	187	2304.00	5693.18	16	34

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-2	188	2304.00	5693.18	15	34
	189	2304.00	5693.18	15	34
	190	2304.00	5693.18	15	32
	191	2304.00	5693.18	15	30
	192	2304.00	5693.18	16	28
	193	2304.00	5693.18	16	25
	194	2304.00	5693.18	16	23
	221	2304.00	5693.18	17	40
	222	2304.00	5693.18	16	36
	223	2304.00	5693.18	16	36
	224	2304.00	5693.18	16	35
	225	2304.00	5693.18	16	35
	226	2304.00	5693.18	15	35
	227	2304.00	5693.18	15	33
	228	2304.00	5693.18	15	33
	229	2304.00	5693.18	15	32
	230	2304.00	5693.18	15	32
	231	2304.00	5693.18	16	32
	232	2304.00	5693.18	15	33
	233	2304.00	5693.18	15	33
	234	2304.00	5693.18	15	32
	235	2304.00	5693.18	15	28
	236	2304.00	5693.18	15	27
	237	2304.00	5693.18	15	25
	238	2304.00	5693.18	15	22
	265	2304.00	5693.18	16	38
	266	2304.00	5693.18	16	37
	267	2304.00	5693.18	15	35
	268	2304.00	5693.18	14	34
	269	2304.00	5693.18	14	33
	270	2304.00	5693.18	13	32
	271	2304.00	5693.18	13	31
	272	2304.00	5693.18	13	30
	273	2304.00	5693.18	14	30
	274	2304.00	5693.18	14	29
	275	2304.00	5693.18	14	29
	276	2304.00	5693.18	13	29
	277	2304.00	5693.18	13	30
	278	2304.00	5693.18	14	30
	279	2304.00	5693.18	14	27
	280	2304.00	5693.18	15	25
	281	2304.00	5693.18	15	24
	309	2304.00	5693.18	16	35
	310	2304.00	5693.18	14	33
	311	2304.00	5693.18	12	32
	312	2304.00	5693.18	12	31
	313	2304.00	5693.18	12	30
	314	2304.00	5693.18	12	28

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NP 3-2	315	2304.00	5693.18	13	27
	316	2304.00	5693.18	13	27
	317	2304.00	5693.18	14	27
	318	2304.00	5693.18	14	26
	319	2304.00	5693.18	14	26
	320	2304.00	5693.18	13	27
	321	2304.00	5693.18	13	27
	322	2304.00	5693.18	13	28
	323	2304.00	5693.18	14	26
	324	2304.00	5693.18	14	25
	325	2304.00	5693.18	13	22
	353	2304.00	5693.18	12	33
	354	2304.00	5693.18	11	32
	355	2304.00	5693.18	11	29
	356	2304.00	5693.18	12	27
	357	2304.00	5693.18	13	27
	358	2304.00	5693.18	13	27
	359	2304.00	5693.18	13	26
	360	2304.00	5693.18	13	25
	361	2304.00	5693.18	13	25
	362	2304.00	5693.18	13	24
	363	2304.00	5693.18	13	24
	364	2304.00	5693.18	13	25
	365	2304.00	5693.18	13	26
	366	2304.00	5693.18	13	27
	367	2304.00	5693.18	13	26
	368	2304.00	5693.18	13	25
	369	2304.00	5693.18	13	23
	398	2304.00	5693.18	11	28
	399	2304.00	5693.18	12	27
	400	2304.00	5693.18	12	26
	401	2304.00	5693.18	12	25
	402	2304.00	5693.18	12	24
	403	2304.00	5693.18	12	23
	404	2304.00	5693.18	12	22
	405	2304.00	5693.18	12	22
	406	2304.00	5693.18	12	21
	407	2304.00	5693.18	12	21
	408	2304.00	5693.18	13	22
	409	2304.00	5693.18	13	22
	410	2304.00	5693.18	13	23
	411	2304.00	5693.18	13	24
	412	2304.00	5693.18	13	25
	413	2304.00	5693.18	13	22
	442	2304.00	5693.18	10	26
	443	2304.00	5693.18	10	25
	444	2304.00	5693.18	11	24
	445	2304.00	5693.18	11	23
NP 3-2	446	2304.00	5693.18	11	21
	447	2304.00	5693.18	10	20
	448	2304.00	5693.18	10	19
	449	2304.00	5693.18	10	18
	450	2304.00	5693.18	10	18
	451	2304.00	5693.18	11	18
	452	2304.00	5693.18	11	19
	453	2304.00	5693.18	12	20
	454	2304.00	5693.18	12	20
	455	2304.00	5693.18	12	21
	456	2304.00	5693.18	12	23
	486	2304.00	5693.18	7	24
	487	2304.00	5693.18	9	22
	489	2304.00	5693.18	10	19
	490	2304.00	5693.18	10	18
	491	2304.00	5693.18	8	17
	492	2304.00	5693.18	8	17
	493	2304.00	5693.18	8	17
	494	2304.00	5693.18	8	16
	495	2304.00	5693.18	9	15
	496	2304.00	5693.18	10	16
	497	2304.00	5693.18	10	17
	498	2304.00	5693.18	11	18
	499	2304.00	5693.18	10	19
	500	2304.00	5693.18	10	20
	501	2304.00	5693.18	11	21
	530	2304.00	5693.18	8	22
	531	2304.00	5693.18	9	20
	533	2304.00	5693.18	8	17
	534	2304.00	5693.18	8	16
	535	2304.00	5693.18	7	15
	536	2304.00	5693.18	6	14
	537	2304.00	5693.18	6	13
	538	2304.00	5693.18	6	13
	539	2304.00	5693.18	6	14
	540	2304.00	5693.18	7	15
	541	2304.00	5693.18	8	17
	542	2304.00	5693.18	9	17
	543	2304.00	5693.18	9	18
	544	2304.00	5693.18	9	19
	545	2304.00	5693.18	9	19
	578	2304.00	5693.18	51	14
	579	2304.00	5693.18	51	13
	580	2304.00	5693.18	51	10
	581	2304.00	5693.18	51	9
NP 3-7	859	2304.00	5693.18	21	24
	860	2304.00	5693.18	20	25
	861	2304.00	5693.18	20	24

MAP INDEX	BLOCK	HECTARES	ACRES	WATER DEPTH (METERS)	DISTANCE FROM SHORE (STATUTE MILES)
NQ 3-7	948	2304.00	5693.18	21	30
	949	2304.00	5693.18	20	29
	951	2304.00	5693.18	18	27
	952	2304.00	5693.18	18	27
	953	2304.00	5693.18	18	26
	954	2304.00	5693.18	18	25
	992	2304.00	5693.18	21	33
	993	2304.00	5693.18	20	32
	994	2304.00	5693.18	19	31
	995	2304.00	5693.18	18	30
	996	2304.00	5693.18	18	29
	997	2304.00	5693.18	18	29
	998	2304.00	5693.18	18	28
	1036	2304.00	5693.18	21	35
	1037	2304.00	5693.18	20	35
	1038	2304.00	5693.18	19	33
	1039	2304.00	5693.18	18	32
	1040	2304.00	5693.18	18	32
	1041	2304.00	5693.18	18	31
	1042	2304.00	5693.18	18	31
NQ 3-8	937	2304.00	5693.18	22	30
	938	2304.00	5693.18	22	28
	939	2304.00	5693.18	23	25
	940	2304.00	5693.18	25	25
	969	2304.00	5693.18	18	28
	970	2304.00	5693.18	19	28
	971	2304.00	5693.18	19	28
	972	2304.00	5693.18	20	28
	981	2304.00	5693.18	20	32
	982	2304.00	5693.18	21	30
	983	2304.00	5693.18	21	28
	984	2304.00	5693.18	21	28
	1013	2304.00	5693.18	19	30
	1014	2304.00	5693.18	19	30
	1015	2304.00	5693.18	19	31
	1016	2304.00	5693.18	20	31
	1020	2304.00	5693.18	18	35
	1021	2304.00	5693.18	17	36
	1022	2304.00	5693.18	18	37
	1023	2304.00	5693.18	18	37
	1024	2304.00	5693.18	18	36
	1025	2304.00	5693.18	19	35
	1026	2304.00	5693.18	19	33
	1027	2304.00	5693.18	19	32
	1028	2304.00	5693.18	20	30

TOTAL: 429 BLOCKS 988,416.00 HECTARES
2,442,374.22 ACRES

APPENDIX B

ENCLAVE ASSUMPTIONS

Prepared by
The Alaska OCS Office

The Enclave Assumption

A. Introduction: Included with the leasing proposal is a critical assumption regarding the siting of OCS onshore facilities and a support camp. This assumption is refered to as an enclave. The specific characteristics of an OCS enclave cannot be established at this time. The need for such a facility and a description of its specific characteristics will only be known after several contingent events and decisions have been made following the proposed lease sale.

Assumptions regarding an enclave are offered in this environmental assessment in order to demonstrate what types of onshore impacts that would or would not occur as a consequence of OCS development and production. As such, the enclave concept is part of the scenario set of presumed conditions accompanying this leasing proposal. The enclave concept is discussed separately from other scenario assumptions because of its key role in mitigating potential adverse effects.

This appendix is organized into three parts: (a) enumeration of specific assumptions which characterize the enclave concept for purposes of impact assessment in this EIS; (b) discussion of policies and regulations which would provide the means for implementing the enclave concept; and (c) recognition of alternative assumptions regarding the enclave, including the possibility of no enclave, for purposes of assessment and mitigation in this EIS.

B. Specific Assumptions: Functionally, the enclave concept is an arrangement providing self-sufficient operation of OCS onshore facilities. Thus, the enclave refers to the siting, operation, and financing of infrastructure and services for both the OCS physical plant and the labor force operating the plant. The principal parameters for characterizing the enclave concept in this EIS refer to infrastructure requirements for onshore facilities and the OCS onshore labor force necessary to operate the facilities. These assumptions are as follows:

1. Employment and Place of Residence:

a. The labor force is assumed to be segregated into three sectors: the primary sector includes personnel directly employed by OCS operators, or subcontractors retained by the OCS operators; the secondary sector includes the labor force whos level of economic acitvity is effected by the volume of primary labor force activity; and the government sector which includes public sector personnel who provide services occasioned by the needs of the OCS primary and local secondary labor forces.

Details on the industry groups comprising the primary, as well as the secondary sectors, can be found in Appendix E, Employment, SESP Technical Report No. 49, "Bering-Norton Petroleum Development Scenarios," and in Appendix: OCS Scenario Assumption, in SESP Technical Report No. 53, "Bering-Norton Petroleum Development Scenarios, Local Socioeconomic Syatems Analysis".

b. During the OCS production phase, the following is assumed:

Local resident participation in the OCS primary labor force would be less than 15 percent of the total annual OCS primary employment. Also, the total

annual local labor force participation and direct OCS employment would be less than 20 percent of Nome's current labor force.

The mutiplier effect of primary OCS employment upon the general secondary employment sector is differentiated between OCS personnel residing in the enclave (0.4) versus local residents (0.1). The general secondary labor force is assumed to reside locally and is not a part of the OCS enclave population. OCS personnel residing in an enclave would generate leas of a multiplier effect locally because of goods and services being provided by the OCS operators at the enclave, and because the enclave personnel are transient, i.e., they commute to places of residence outside the region on their off-shift period.

The multiplier effect of primary OCS employment on government employment ia 0.1 of the total onshore primary employment, including both local reaiding and enclave personnel. This multiplier is expressed aa a function of all onshore employment because growth in the local government workforce is expected as a function of property tax revenues; property tax revenue maxama are a function of per capita population counta. (Refer below to the annexation assumption.)

c. During the exploration and development phasea, the following is assumed:

No government employment multiplier would apply because construction has not been completed on the taxable OCS physical plant.

During the exploration phase, only onshore employment would be available for existing reaidents of the Nome area.

During the development phase, the onshore primary and secondary employment multipliers are the same as for the production phaae mentioned above.

d. The distribution of the OCS primary labor force as to place of reaidence while on duty is three-fold: local residenta of the Nome area or the environa, resident onshore (enclave), and reaident offshore (exploratory vessel, production platform, service barge, etc.). The following data indicate the percentage of OCS primary labor force which are local residenta. The local residents, or non-enclave, percentage ia expresaed as a function of employment sectors within the OCS primary labor force, and not the entire primary labor force itaelf:

Exploration Phase		
Platform: 0	Transportation: 0	Shore-baaed: 20%
Construction (Phase)		
Platform: 0	Onshore Construction: 0	Pipeline Construction: 0
Production Phaae		
Platform: 0	Transportation: 25%	Terminals: 75%

2. Population: The OCS labor force, which ia tranaient and not locally residing, is assumed to not include any dependent population in the Nome area. The non-resident OCS personnel would reside in group housing quarters either

at the onshore enclave facility or offshore drill rig sites. A locally residing OCS labor force would include dependents. Specific dependency ratios are indicated in SESP Technical Report No. 53.

3. Infrastructure Standards:

a. Generally, the OCS enclave is expected to provide utilities and services that would otherwise be provided by general purpose government. These include fire protection, solid waste, recreation, water, sewage, electricity, and health.

However, some services would be provided separately by the city of Nome and by the State of Alaska in response to the interaction between the OCS enclave residents and the Nome area.

b. The Alaska State Troopers would be expected to provide law enforcement protection to the onshore enclave camp, as well as the city of Nome locations where problems and social interactions occur between local residents and enclave personnel.

c. Generally, the enclave would be expected to provide its own on-site recreational facilities. However, OCS personnel would be expected to use some city facilities that would not available at the enclave (swimming pool, ice rink, etc.). Also, enclave personnel would be expected to participate in organized recreational activities with the people of Nome.

d. Acute health care facilities would be available both at the onshore OCS facilities and the city of Nome. In some circumatances, demand for acute and emergency health care would involve usage of local health facilities.

e. An existing state highway from Nome to the Safety Sound area may be adequate to serve the OCS light vehicle traffic. However, heavy duty vehicle traffic, especially during the construction of the onshore physical plant, would require upgrading of the existing highway or the conatruction of an industrial bypass highway route to Nome.

4. Annexation: The OCS enclave and onshore physical plant are assumed to be annexed by the city of Nome once the OCS development and production plans are submitted. It should be noted that the city of Nome has attempted several times to annex lands within its vicinity and has failed to receive approval. However, these past annexations have not been predicated upon a clearly foreseeable OCS onshore development. The significance of the annexation assumption is two-fold: (a) the city of Nome could assess property taxes and generate significant municipal revenues against the assesaed value of the OCS onshore physical plant, and (b) city jurisdiction over the onshore facility sites would influence planning and operation of the facilities.

5. Social and Political Interaction:

a. The enclave facility is not assumed to have any operational restrictions on employee activities off the premises during off-duty periods. Restrictions of the OCS operators and/or the private leaseholders may entail restrictions on interaction with the surrounding areas, including Nome.

b. Some amount of leisure and recreational activities would occur in Nome, depending upon the preferences of the OCS enclave labor force, intervening distance factor between Nome and Cape Nome, and the available leisure time. Recreational activity of the enclave labor force may alao include sport hunting and fishing during off-duty periods; however, past industry experience in Alaaka indicates thia would be dissallowed. The enclave labor force would be included in population counts for the city of Nome. However, the labor force is not assumed to be considered permanent residenta of the region in terms of voter registration or participation in local political franchise.

C. Policies and Authorities for Enclave Implementation: Regulatory devices are available to realize the enclave concept. Theae devices are briefly mentioned as potental mitigating measures in context with the environmental assessment procedures under NEPA. However, it should be emphasized that the Department of the Interior, as lead agency of this proposal, has no authority over the siting of onshore OCS facilities, nor the implementation of an enclave concept.

1. OCS Development and Production Plans Submittal and EIS.

If OCS operators decide to develop a commercial field in the proposed sale 57 area, they would be required to prepare a Development and Production Plan and an EIS on the plan submittal. The plan and EIS would initiate the first major documentation of proposed onshore facilities, the associated housing, support requirementa, etc. USGS regulations on OCS plan submittal and approval require a certain documentation of onshore impacts (30 CFR 250.34-3(b); 44 FR 53698). Additionally, under the NEPA EIS format, the plan would look at alternatives to the proposal, one of which could include the enclave concept.

The USGS OCS plan approval authority refers to facilities and operationa located on the outer continental shelf, not onshore. Approval authority of the EIS regarding onshore facilities is unlikely to extend to detail mitigating effects of the enclave concept. However, EIS processing, including public comment on the proposal, provides a form for suggesting desirable site planning and facility operation arrangements.

2. Alaska Coastal Management Program: There are several features within the approved state Coastal Management Program which are pertinent to the implementation of the enclave concept. These include:

a. ACMP Energy Facilities Siting Proceas. The ACMP provides procedures for review and adoption of District Coastal Management Plans (CMP), as well as management of the coastal zone by state authoritiea in the absence of an approved district program. The energy facility siting process consists of guidance by the State Office of Coastal Management, as well as the Guidelines on Energy Facility Siting of the Alaska Coastal Policy Council (6 AAC AD. 070).

Some of the criteria in paragraph (b) of 6 AAC 80.070 includes socioeconomic considerations in facility siting. In particular, criterion (b)(1) indicates that facilities should be sited to minimize social effects while satisfying industrial requirements. In the ACMP energy facility planning process, a background discussion on the individual criteria of 6 AAC 80.070 is provided. Tbe discussion regarding criteria (1) through (4) raisea some of the rationale

for an enclave arrangement of energy facilities as described above. However, the ACMP guidance does not explicitly mention or encourage the enclave concept. The standards clearly provide discretion to state agencies and district CMP's in planning for energy facility development.

b. District Coastal Management Programs (CMP):

The District Coastal Management Programs (CMP) represent ACMP regional and/or local level. The Alaska Coastal Management Act (ACMA) provides authority for district CMP's to be prepared by general purpose governments (mandatory for first class cities and boroughs), as well as regions within the unorganized borough. The preparation and adoption of district CMP provides opportunity for local self determination in coastal management with some restrictions to state and national intereats as required under the state ACMA and the Federal CZMA.

The critical role of the District CMP, with regard to enclave arrangement of energy facilities, is that the local program has the discretion, as well as the greatest interest, in articulating energy facilities siting requirements and changes. In the Norton Sound and Yukon Delta area, this authority is vested in the Nome District CMP, the Bering Straits Coastal Resource Service Area Board (CRSA), and the Yukon-Kuskokwim Delta CRSA Board. These programs are in progress presently and do not provide any indication of whether an enclave arrangement and operation, as discussed above, would be required or encouraged.

c. Consistency Review Process: The consistency review provision of the Federal Coastal Zone Management Act provides leverage for approved state coastal management programs to influence Federal decisionmaking on the issuance of permits, licences, and Federal projects which directly affect the coastal zone.

Of significance to the siting of onshore OCS facilities is an explicit requirement in the Federal CZMA that consistency review shall be performed regarding all permits and licences required with approval of an OCS Development and Production Plan. Thus, although the U.S. DOI has no authority over siting of onshore facilities, the consistency review provision in the CZMA effectively incorporates facility siting and planning considerations by Federal agencies having permit or licence authority over construction of such OCS onshore facilities.

Conceivably, specific policies of a District CMP, or interpreted requirements from the state ACMP regarding enclave arrangements and operations of onshore OCS energy facilities would be binding upon a lead permitting and licencing agency so long as state and national interest concerns are satisfied.

3. Private Land Use Restrictions: The authorities mentioned above refer to public regulation of energy facilities planning and siting. However, private regulation of such facilities is possible through leasehold and deed restrictions tied to the lands in which the facilities are sited and operated. The availability and application of this source of authority is valid, if not likely, in the Norton Sound-Yukon Delta area, because the private land is predominantly owned by Native corporations created under the Alaska Native

Claims Settlement Act. A significant precedent for private leasehold restrictions on OCS onshore facilities was created by the Yak-Tat Kwaan in Monti Bay of southeastern Alaska (USGS, 1980).

The specific form of leasehold restrictions are clearly within the discretion of the landowner and the type of agreement established with the lessee or the purchaser of the land. An early indication of the facility siting and operation requirements imposed by Native corporations in the Norton Sound area may be evidenced in an exploration agreement established between the Calista Corporation and AMOCO Production Company. Refer to Section IV.A.8. for identification of projects considered for cumulative impact assessment.

D. Alternative Assumptions and Mitigating Effects: The enclave concept has been identified in terms of descriptive assumptions and implementing authorities. The primary consideration of the enclave concept with this proposal is its mitigating effect upon adverae impacts identified in Section IV of this EIS. The professional judgment of the EIS authors is that a variation of the enclave concept would be applied to siting and planning of onshore energy and port facilities. This judgment is reflected in the enclave concept being assumed with this proposal, along with the petroleum exploration and development scenario.

However, the status of an assumption in an EIS should be distinguished from that of a mitigating measure. Since the enclave concept functions as both an assumption and a mitigating measure for purposes of an environmental assessment, the distinction between these two roles in the EIS is critical:

1. As an assumption, the enclave concept is merely a set of descriptive conditions. These conditions could be changed along the range of parameters identified above. In consequence, the environmental assessment would also change. However, only one set of assumptions are used to characterize the enclave for two principal reasons: more detailed and fruitful analysis on the concept can be performed at a later date, once specific onshore development proposals are provided; and, the range of impacts attributed to different enclave assumptions would not significantly change the findings in individual impact sections of this EIS. That is, the assessment differentiates between an enclave versus a non-enclave case as a basis for demonstrating varied findings on impacts.

2. As a mitigating measure, the enclave concept is discussed under Other Mitigating Measures beyond DOI authority (Sec. II.B.1.d.). The enclave concept is not the subject of DOI authority, nor is it prescribed by Federal statute. DOI has no authority over onshore facilities siting and planning on non-Federal lands, and finally, the measure is subject to state, private, and other Federal authority which is essentially discretionary. Hence, it cannot be considered a potential mitigating measure.

APPENDIX C

SUMMARY OF ARCTIC OCS OPERATING ORDERS

Prepared by
U.S. Geological Survey,
Conservation Division

Oil and Gas Operating Regulations and Proposed OCS Orders for the Bering Sea OCS

Regulations governing lease operations on the OCS are administered by the U.S. Geological Survey (USGS). These regulations are contrived in Title 30, Part 250 of the Code of Federal Regulations (CFR). These regulations will be supplemental in the Norton Sound by the OCS Orders. At the present, we have Gulf of Alaska and Arctic Orders in force. Revised Gulf of Alaska Orders were published in the Federal Register December 21, 1979, and made effective January 1, 1980. Final Arctic OCS Orders were published on February 27, 1981, and were made effective the same date. As it stands, no orders are in effect for the Bering Sea OCS area extending north of the Aleutian Chain to the Bering Sea Straits.

The requirements of the existing Gulf of Alaska, as well as the Arcitc Orders, address the subfreezing conditions. The Arctic Orders also contain some requirements to address the remoteness of the area, the permafrost and hydrates that are presumed to be prevalent in the area, presence of ice in Arctic waters through most of the year, and drilling from artificial islands. While some northern parts of the Bering Sea OCS area may be similar to the Arctic OCS, some of the southern parts have conditions similar to those existing in the Lower Cook Inlet, where the Gulf of Alaska Orders apply. Most of the general requirements are the same in both of these OCS Orders. Furthermore, there are only a few additional requirements that have been incorporated specifically to address the arctic conditions. One option would be to develop a separate set of Bering Sea OCS Orders. These orders would be identical to Arctic OCS Orders, in most respects. However, USGS believes that the development and adoption of just one set of Alaska OCS Orders, that would address the special conditions prevalent in both the arctic and subarctic areas of the Alaska OCS, would be a significant step towards streamlining of OCS Orders for the Alaska Region.

The proposal to have just one set of Alaska OCS Orders will be published in the Federal Register in the near future for comments. The final Alaska OCS Order Nos. 1, 2, 3, 4, 5, 7, 8 and 12, that will be developed after a review of the comments, will be in place prior to the proposed lease sale. As it is expected that these final Alaska OCS Orders will resemble extensively in format and content with the Arctic OCS Orders, now in effect, the full text of these orders is reproduced in Appendix_____. Orders 6, 9, 11, 13, and 14, which are associated with the post-exploration or production phase of offshore operations, are still undergoing internal review and will be available for public comment in the future. OCS Order No. 10 concerns marine sulfur extraction and will probably not be issued for the Alaska OCS. Additional OCS Orders may be prepared and issued, or the exising orders revised, as the need occurs throughout OCS operations in Alaska. In the case of non-compliance, lessees are subject to the penalty provided for in the OCS Lands Act of 1953, as amended. A general description of

operating requirements under the proposed Arctic Orders, and their mitigatory aspects, are summarized below:

OCS Order No. 1

This order requires all platforms, drilling rigs, drilling ships, and wells to have signs of standard specifications for identification of the operator, the specific lease block of operation, and well number.

This Order also requires that all subsea objects, resulting from lease operations which could present a hazard to other users of the OCS, must be identified by navigational markings as directed by the U.S. Coast Guard District Commander. Under this provision, the potential of accidents associated with subsea production systems, "stubs", fishing gear, and ship anchors, is substantially reduced as is the possibility of an oilspill from such an accident.

This Order also requires, whenever practicable, owner's identification, as approved or prescribed by the Director, to be placed upon all materials, cable, equipment, tools, containers, and other objects which could be freed and lost overboard from rigs, platforms, or supply vessels, and are of sufficient size, or are of such a nature, that they could be expected to interfere with commercial fishing gear if dropped overboard.

The Order mitigates impacts caused by offshore drilling and completion operations, fishing anchoring, shipping, and navigaticn activities.

OCS Order No. 2

Order No. 2 concerns procedures for the drilling of wells. It requires the operators to file, under an approved Exploration or Development and Production Plan, a drilling application which includes information on the drilling platform or vessel, well casing, mud control, safety training of the operator's personnel, and a list describing critical drilling operations which may be performed. The Order then describes certain procedures, or equipment, to be used in each phase of the drilling operation.

Lessees will be required to submit with their Exploration Plan, and Oevelopment and Production Plans, a plan showing their capability to start drilling a relief well to control a blowout, should one occur. This will have to be acceptable to the Supervisor from a technical and timing standpoint. They must also outline plans to deal with emergency situations such as loss or disablement of drilling unit or a drilling rig, loss of or damage to support craft, or to deal with hazards unique to the site of the drilling operations; including conditions such as - solid ice cover, freeze up and breakup. These requirements should mitigate concerns about the safety of operations and also the ability of operators to start drilling a relief well(s) to control a blowout, should one occur, within a reasonable time frame.

Due to the technical complexity of the Order, not all details are included in describing its mitigatory impact. This Order requires that drilling

platforms and vessels be capable of withstanding the oceanographic and meteorological conditions of the area; applications must include all pertinent data on the fitness of the platform or vessel, and each such drilling structure must be inspected by the U.S. Geological Survey (USGS) for compliance with the OCS Orders. During the period of operations, operators must collect and report oceanograhic, meteorological, and performance data. These requirements should mitigate concerns about the impact of weather, waves, sediment scour, and currents on offshore drilling units.

To mitigate concerns about suitable materials and equipment being used in the Bering Sea OCS, lessees will be required to ensure that they are suitable for operations under prolonged periods of subfreezing conditions.

Order No. 2 requires operators to conduct shallow geological hazard surveys of the well site or lease block, prior to the commencement of drilling operations. The purpose of each survey is to locate shallow gas deposits, near-surface faults, obstructions, unstable bottom areas, or other conditions which are hazardous to drilling operations.

All wells must be cased and cemented to support unconsolidated sediments and to prevent communication of fluids between the formations, or pressure changes in the well. If there are indications of improper cementing, the operator shall re-cement and run logs to insure proper sealing of the well, or take other actions as approved by the Supervisor. The casing design and setting depths are to be based on all engineering and geologic factors, including the presence or absence of hydrocarbons, potential geologic hazards, and water depths. Additional casing strings may be required if abnormal geopressures are encountered. A pressure test is required of all casing strings, except the drive or structural casing, to determine the presence of leaks or inadequate cementing. The use of a casing program as described in this Order should eliminate potential impacts of freshwater zone contamination, lost production, or the possibility of accidents caused by inadequate well control.

Operators are required to obtain directional surveys on all wells. These surveys, which are filed with the Supervisor, indicate whether the well is drilled in accordance with the planned borehole migration. These surveys also provide the information required for the "target" of a relief well in the event of a blowout.

Since permafrost and/or hydrates could be encountered while drilling, especially in the northern portions of the Bering Sea OCS, lessees will be required to design their wells and the drilling programs suitably. This will ensure safe drilling operations and reliable casing/cementing programs, thus preventing release of any hydrocarbons into the marine environment.

Blowout preventers and related pressure control equipment must be installed, used, and tested in a manner necessary to insure positive well control. A specific number of these preventers must be used in every well, and they must be equipped with dual control systems. The blowout preventers and

related control equipment shall be adequately protected to ensure reliable operation under existing weather conditions. Special requirements are included for floating drilling operations which necessitate the placement of the blowout preventer stack on the seafloor. These devices provide protection against oilspills resulting from a loss of well control.

There are specific requirements for the use and testing of drilling muds. Drilling muds have a number of critical functions, one of the most important being the control of subsurface pressures and the prevention of gaseous and liquid influxes into the wellbore. Drilling mud programs must be approved prior to the commencement of drilling. The operator must, at all times, maintain sufficient and readily accessible quantities of mud to insure well control. Drilling operations shall be suspended in the absence of minimum quantities of mud material specified, or as modified in the approved Plan.

Lessees will be required to ensure that all enclosed mud handling areas, where dangerous concentrations of combustible gases may accumulate, are equipped with a ventilation system, with gas monitors and electrical equipment of the "explosion proof" type. This will ensure safety in the mud handling areas which will be enclosed in the colder environment of the Bering Sea OCS.

Representatives of the operator must provide on-site supervision of drilling operations around the clock. A member of the drilling crew, or the Tool Pusher, must maintain surveillance of the rig floor continuously from the time drilling operations commence until the well is secured with blowout preventors, bridge plugs, storm packer, or cement plugs. Lessee and drilling contractor personnel shall be trained and qualified in present-day methods of well control, and records of the training are to be kept at the well site. Specific well control training requirements are outlined in U.S. Geological Survey OCS Standard No. Tl (GSS-OCS-Tl). The training requirements are intended to minimize the potential for well blowouts caused by human error. Formal training is supplemented with weekly blowout-prevention exercises for all rig personnel. Drills are frequently witnessed by USGS representatives and must always be recorded in the Driller's log.

Procedures to be followed when drilling operations may penetrate reservoirs known or expected to contain hydrogen sulfide (H_2S), or in areas where the presence of H_2S is unknown, are included in U.S. Geological Survey OCS Standard No. 1 (GSS-OCS-1), "Safety Requirements for Drilling Operations in a Hydrogen Sulfide Environment." This set of standard operating procedures will assure proper equipment testing, and crew training, should highly toxic H_2S be encountered. Hazards of H_2S are substantially reduced by the institution of these procedures.

Since some operations performed in drilling are considered more critical than others with respect to well control, and for the prevention of fire, explosions, oilspills, and other discharges and emmissions, each lessee must file a Critical Operations and Curtailment Plan for the Supervisor's approval.

This Order includes a requirement for listing and describing of critical operations that are likely to be conducted on the lease. Before exceeding the operational limits of an approved plan, the operator must notify the Supervisor and curtail operations. This allows the USGS to provide either specific approval in advance of the conduct of the critical operation, or to dispatch personnel to the lease site for observation of the operation. This part of OCS Order No. 2 provides additional regulatory review of drilling operations which may be hazardous to the drilling platform, vessel, crew, and the environment.

Order No. 2 also requires that when sufficient geological and engineering information is obtianed as a result of drilling operations, the lessee may make an application, or the Supervisor may require an application, for the establishment of field drilling rules. After field drilling rules have been established by the Supervisor, development wells shall be drilled in accordance with these rules, and the requirements of this Order, which are not affected by such rules.

In accordance with Section 21 of the OCS Lands Act Amendment (OCSLAA) of 1978, this Order requires the use of the Best Available and Safest Technologies (BAST). (This is discussed in the analysis of Order 5.)

OCS Order No. 3

This Order relates to the plugging and abandonment of wells. For permanent abandonment of wells, cement plugs must be placed so as to extend above the top, and below the bottom, of freshwater and oil or gas zones to prevent those fluids from escaping into other strata. Portions of a well in which abnormal pressures are encountered are also required to be isolated with cement plugs. Plugs are required at the bottom of the deepest casing where an uncased hole exists below. Plugs or cement retainers are required to be placed above and below any perforated interval of the well hole used for production of oil and gas. If casing is cut and recovered, the casing stub shall be plugged.

Any annular space communicating with any open hole and extending to the ocean floor shall be plugged with cement. A surface plug at least 45 meters (148 feet) in length, with the top of the plug 45 meters (148 feet) or less below the ocean floor, shall be placed in the smallest string of casing which extends to the ocean floor.

The setting and location of the first plug below the surface casing shall be verified by either placing a minimum pipe weight on top of the plug or by pressure testing it with a designated minimum pump pressure. The space between the plugs must be filled with drilling mud of sufficient density to exceed the greatest formation pressure encountered in drilling the interval.

The casing and piling on the seafloor must be removed to a depth below the ocean floor, as approved by the Supervisor. For temporary abandonments, all plugs and mud, discussed above, must be placed in the well with the exception of the surface plug. (The temporarily abandoned well would have to be marked in accordance with Order No. 1.)

Due to the possibility of occurrence of subsea permafrost in the northern portions of the Bering Sea OCS, the leesees will be required to ensure that the fluids left in the hole adjacent to permafrost zones have a freezing point below the temperature of the permafrost zone in order to prevent possible casing damage due to internal freezeback. In addition, these fluids will have to be treated to minimize corrosion of the casing. These measures will mitigate concern about integrity of the well being damaged, subsequent to abandonment because of permafrost, which could cause leakage of well fluids into marine environment.

This Order should eliminate concern about contamination of freshwater zones or the possibility of oil and gas leaks from abandoned wells. The requirements that the seafloor above each final abandonment must be cleared, and that the removal depth of casing and piling must be examined on a case-by-case basis, will provide protection to navigation and fishery interest. The chance that obstructions might become exposed due to changes in bottom conditions is reduced as well.

OCS Order No. 4

Order No. 4 provides for the extension of a lease beyond its primary term for as long as oil or gas may be produced in paying quantities and the lessee has met the requirements for diligent development. If these circumstances should occur, a lease can be extended beyond its initial term pursuant to the authority prescribed in 30 CFR 250.10 and 250.11, and in accordance with 30 CFR 250.12.

In addition to a production test for oil, one of similar duration is required for gas. All pertinent engineering, geologic, and economic data are required to support a claim that a well is capable of being produced in commercial quantities. Each test must be witnessed by the USGS although, with prior approval, an operator affidavit and third party test results may be acceptable. When the District Supervisor determines that open hole evaluation data, such as wireline formation tests, drill stem tests, core data, and logs, have been demonstrated as reliable in a geologic area, such data may be considered as acceptable evidence that a well is capable of producing in paying quantities. The primary purpose of this Order is to provide for determinations of well productivity which may permit extensions of lease terms. Such extensions are frequently necessary to insure the orderly development of OCS oil and gas resources.

Order No. 5

This Order sets forth requirements for the installation, design, testing, operation, and removal of subsurface safety devices. Due to the technical complexity of the Order, not all details are included in describing its mitigatory impact. In accordance with Section 21 of the OCSLAA of 1978, this Order requires the use of BAST. The lessee is encouraged to continue

the development of safety-system technology. As research and product improvement results in increased effectiveness of existing safety equipment or the development of new equipment systems, such equipment may be used, and if such technologies provide a significant cost effective incremental benefit to safety, health, or the environment, shall be required to be used if determined to be BAST. Conformance to the standards, codes, and practices referenced in this Order, will be considered to be the application of BAST. Specific equipment, and procedures or systems not covered by standards, codes, or practices, will be analyzed to determine if the failure of such would have a significant effect on safety, health, or the environment. If such are identified, and until specific performance standards are developed or endorsed by the USGS, the lessee shall submit such information necessary to indicate the use of BAST, the alternatives considered to the specific equipment or procedures, and the rationale why one alternative technology was considered in place of another. This analysis shall include a discussion of the cost involved in the use of such technology and the incremental benefits gained.

This Order requires that Safety and Pollution-Prevention Equipment (SPPE) shall conform to the following quality assurance standards or subsequent revisions which the Chief, Conservation Division, USGS, has approved for use.

a. American National Standards Institute/American Society of Mechanical Engineers Standard "Quality Assurance and Certification of Safety and Pollution Preventional Equipment Used in Offshore Oil and Gas Operations", ANSI/ASME SPPE-1-1977, December 1977, (formerly ANSI/ASME-OCS-1-1977).

b. American National Standards Institute/American Society of Mechanical Engineers Standard "Accreditation of Testing Laboratories for Safety and Pollution Prevention Equipment Used in Offshore Oil and Gas Operations", ANSI/ASME-SPPE-2-1977, December 1977, (formerly ANSI/ASME-OCS-2-1977).

This Order requires that all well tubing installations, open to hydrocarbon-bearing zones, shall be equipped with a subsurface-safety device such as a Surface-Controlled Subsurface-Safety Valve (SCSSV), a Subsurface-Controlled Subsurface-Safety Valve (SSCSV), and injection valve, a tubing plug, or a tubular/annular subsurface-safety device unless, after application and justification, the well is determined to be incapable of flowing.

The lessee shall furnish evidence that the surface-controlled subsurface-safety devices and related equipment are capable of normal operation under subfreezing conditions. The surface controls may be located at a remote location.

These surface and subsurface safety valves, shall conform to "American Petroleum Institute (API) Specification for Subsurface-Safety Valves", API Spec 14A, Fourth Edition, November 1979, or subsequent revisions which the Chief, Conservation Division, has approved for use at the time of installation.

Testing or checking of these devices must be done at specified intervals. If a device does not operate correctly, it must be promptly removed and a properly operating device must be put in place and tested. Additionally, all tubing installations open to hydrocarbon-bearing zones and capable of flowing in which the subsurface-safety device has been removed, in accordance with the provisions of this Order, shall be identified by a sign on the wellhead stating that the subsurface-safety device has been removed. A subsurface-safety device shall be available for each well on the platform. In the event of an emergency, such as an impending storm, this device shall be properly installed as soon as possible with due consideration being given to personnel safety.

The subsurface-safety valves prescribed in this Order serve as a mechanism for automatically shutting in a well below the ocean floor in the event of an accident, or natural event, which destroys, or threatens to destroy, surface well control equipment. The reliability of such devices is maximized through regular testing. As a result of these requirements, the probability of a producible well blowout is minimized.

Proposed Order No. 5 also sets forth requirements for the design, installation, operation, and testing of safety systems for platform production facilities. All new platforms resulting from this sale will have to be in conformance with API RP 14C, "Analysis, Design, Installation, and Testing of Basic Surface Safety Systems on Offshore Production Platforms."

Prior to the installation of platform equipment, the lessees must submit, for the District Supervisor's approval, schematic diagrams with equipment, pipeing, firefighting, electrical-system, gas-detection, and safety-shutdown specifications. A Safety Analysis Function Evaluation Chart must also be submitted. This chart relates all sensing devices, shutdown devices, and emergency-support systems to their functions. The chart provides a means of verifying the design logic of the basic safety system.

This Order requires additional safety and pollution control requirements which modify or are in addition to those contained in API RP 14C for operation of pressure vessels, flowlines, pressure senors, emergency shutdown systems, engine exhaust systems, glycol dehydration units, gas compressors, fire fighting systems, fire and gas detection systems, electrical equipment, and erosion detection and measurement equipment.

Whenever operators plan to conduct activities simultaneously with production operations, which could increase the possibility of occurrence of an undesirable event, a "General Plan for Conducting Simultaneous Operations" in a producing field must be filed for the Supervisor's approval. Activities required in the Plan include drilling, workover, wireline, pumpdown, and major construction operations. The intent of this requirement is to permit USGS review of the conduct, control, and coordination of the proposed operations. This review will determine whether the operations can

be conducted simultaneously without significantly increasing the risk of accidents or spills.

Prior to welding or burning operations, lessees must submit a plan describing personnel requirements and designating safe welding areas. Procedures for establishing safe welding areas, and for conducting operations outside such areas, are specified in this Order. The requirements reduce the potential for explosions, injuries, and pollution discharges.

This Order also requires the lessees to maintain records, for a minimum period of 5 years, for each surface-safety device installed. These records shall be available for review by any authorized representative of the USGS. The records shall show the present status and history of each device, including dates and details of installation, inspection, testing, repairing, adjustments, and re-installation.

As per USGS's Failure and Inventory Reporting System (FIRS), which applies to offshore structures, including satellites and jackets, which produce or process hydrocarbons and includes the attendant portions of hydrocarbon pipelines, when physically located on the structure. When the devices specified are used as a part of the production safety and pollution prevention system, this Order requires the lessee to:

a. Submit an initial inventory of the safety and pollution prevention devices with periodic updates.

b. Report all device failures which occur.

To mitigate the potential for accidents resulting from human error, all personnel engaged in installing, inspecting, testing, and maintaining safety devices must meet specific training requirements. This Order also sets forth requirements for employee orientation and motivation programs concerned with safety and pollution prevention in offshore oil and gas operations.

OCS Order No. 7

Order No. 7 relates to the prevention of pollution to the marine environment and provides rules for the disposal of waste materials generated as a result of offshore operations in a manner which will not "adversely affect the public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean."

The operators must submit a list of drilling mud constituents, additives, and concentrations expected to be used; this provides a means to evaluate or alter the use and/or disposal of specific components which might be harmful to the environment. The disposal of drilling mud and drill cuttings, sand, and other well solids, including those containing oil, is subject to the Environmental Protection Agency's permitting procedures, pursuant to the Federal Water Pollution Control Act, as amended. Approval of the method of drilling mud disposal into the ocean shall be obtained from the District Supervisor; each request will be decided on a case-by-case basis.

This Order requires that curbs, gutters, drip pans, and drains shall be installed in all deck areas in a manner necessary to collect all contaminants and to be piped to a properly designed, operated, and maintained sump system which will automatically maintain the oil at a level sufficient to prevent discharge of oil into OCS waters. Also, no solid waste materials or debris can be disposed of in the marine environment. Compliance with these requirements virtually eliminates the potential for adverse impacts on the biological communities, water quality, commercial fisheries, and offshore recreation, and also mitigates impacts along the coastline which could be caused by the washing of oil, fuel, chemical residues, or toxic substances to shore.

The disposal of equipment into the sea is prohibited, except under emergency conditions. The location and description of any equipment so discharged must be reported to the Supervisor. This requirement is intended to mitigate the potential for interference with commercial fishing operations. All personnel must be thoroughly instructed in the prevention of pollution from offshore operations. Rigorous inspection schedules are required for all facilities. Pollution reports are required for all oilspills, and procedures are set forth for the notification of proper authorities. Pollution-control equipment must be maintained, or available, to each lessee. The equipment must include booms, skimmers, cleanup materials, and chemical agents. The equipment must be maintained and inspected monthly. (Chemical agents or additives for treatment of oilspills require the consent of the Supervisor in accordance with Annex X, National Oil and Hazardous Substance Pollution Contingency Plan, and in accordance with the Memorandum of Understanding (MOU) between the Department of Transportation (U.S. Coast Guard) and the Department of Interior (U.S. Geological Survey), dated August 16, 1971.)

This Order also sets forth requirements for pollution inspection of manned and unattended facilities on a daily basis or at intervals prescribed by the Supervisor. Also, it sets forth requirements for pollution reports.

Operators must submit an Oilspill Contingency Plan for approval by the Supervisor before an application to conduct drilling operations may be approved. The Plan must contain provisions for varying degrees of response effort depending on the severity of the oilspill; identification of available containment and cleanup equipment; notification of responsible persons and alternates in the event of a spill; identification of areas of special biological sensitivity; and specific actions to be taken after the discovery of an oil discharge. Should a spill occur, immediate corrective action must be taken.

Drilling and training classes for familiarization with pollution-control equipment and operational procedures must be conducted on a schedule approved by the Supervisor. The drills must include the deployment of equipment.

Although the emphasis of the OCS Orders is on the prevention of oilspills, it is recognized that spills will occur. It is also recognized that it is not technically possible to completely control and mechanically remove all oil that is discharged. The intent of this portion of the Order is to insure that the operators have ready access to the best practical control equipment for the area, and for the prevailing conditions, and that personnel are trained to effectively utilize the equipment. The operator's plans must have sufficient flexibility to permit different spill-control strategies for different environmental conditions. This provides for mechanical and chemical measures which best compliment the forces of nature and maximize the protection of biological communities, shoreline resources, and commercial interests.

OCS Order No. 8

This Order sets forth requirements for the design, installation, major modification and repairs, and verification of platforms and structures (including man-made ice and gravel islands).

The Order specifies the procedures for the Platform Verification Program, as well as the requirements for verifying the structural integrity of the OCS platforms.

All structural plans must be certified by a registered professional structural engineer or a civil engineer specializing in structural design. Verification of the design, fabrication, installation, and modifications to offshore platforms and structures, will be done by a certified verification agent who is nominated by the lessee.

The Order requires submittal of the design plan to cover design documentation, general platform information, environmental and loading information, foundation and structural information, and the design verification.

For new platforms, or other structures, and for modifications which are subject to review under the requirements of the Platform Verification Program, the lessee shall submit a Fabrication Verification Plan for new platforms or other structures, and for modifications subject to review under the requirements of the Platform Verification Program, the lessee shall submit an Installation Verification Plan subsequent to the submittal of the Fabrication Verification Plan.

Order No. 8 also requires the lessee to compile, retain, and make available for review for the functional life of the platform or other structure that is subject to the provisions of this Order, the as-built structural drawings, the design assumptions and analysis, and a summary of the Non-Destructive Examinations records.

This Order assures careful review of platform design and minimizes the possibility of spills and environmental damage resulting from structural failure.

OCS Order No. 12

This Order sets forth requirements for the public availability of data and records concerning offshore petroleum operations. As per this Order, specific types of data and records pertaining to drilling and production operations, well tests, sale of lease production, accidents, inspections, and pollution incidents, are to be available for public inspection. Privileged information, such as certain geological and geophysical data, would be made available for public inspection with the lessee's consent or after a fixed period of time has elapsed. By making operations data available, this Order permits increased public awareness of OCS activities and involvement in OCS programs. Increased public interest and understanding should result in continuing improvements in the safety and pollution-prevention programs of both industry and Government.

APPENDIX D

ENVIRONMENTAL HAZARDS TO OCS EXPLORATION AND DEVELOPMENT IN NORTON SOUND, AND THE STATUS OF TECHNOLOGIES TO COPE WITH THESE HAZARDS

Norton Sound Synthesis Meeting
October 28-30, 1980

ENVIRONMENTAL HAZAROS TO OCS EXPLORATION AND OEVELOPMENT IN NORTON SOUNO, ANO THE STATUS OF TECHNOLOGIES TO COPE WITH THESE HAZARDS

DRAFT

I. INTROOUCTION

In an effort to identify those environmental hazards most likely to impact various facilities and activities associated with OCS exploration and development, four topics were addressed as this part of the Norton Sound· data synthesis: (1) identification of potential environmental hazards to facilities and/or activities necessary for petroleum exploration and development, (2) status of current technologies to cope with the potential hazards, (3) additional data needs to better define and understand hazards of the area, and (4) assessment of environmental hazards as related to different leasing scenarios. By means of comparing the potential hazards to specific facilities or activities while at the same time assessing the technology available to cope with a particular hazard, it was possible to derive an overall assessment of just which hazards presented the greatest threat to what particular facilities or activities. An effort was also made to assess the current level of knowledge pertaining to a particular hazard and whether further study was necessary to define the hazard to allow for sound management decisions. In light of leasing alternatives suggested for Norton Sound, the various environmental hazards were considered for each of the proposed scenarios so as to determine the degree of impact these hazards would have with the respective leasing options.

II. HAZAROS, FACILITIES, ANO ACTIVITIES

As a result of the review conducted, 16 potential environmental hazards were identified which could impact OCS exploration and development in Norton

Sound to varying degrees. As noted from the following list, these hazards are quite diverse:

Ice Forces (ice not reaching the bottom)	Current Scour
Ice Gouging (bottom-reaching ice)	Sediment Sheet Flow
Icing	Sand Waves
Faulting	Biogenic Gas Charging
Seismicity (earthquakes)	Thermogenic Gas Charging
Liquefaction	Coastal Erosion
Wind and Waves	Permafrost
Storm Surge	Sediment Sensitivity

Eleven man-made facilities and/or activities commonly associated with OCS exploration and development were identified as being potentially impacted by some or most of the above hazards. The following list also indicates the activity commonly associated with the respective item (E- exploration, D - development, P - production):

Jack-up Rigs (summer use only, E)	Tankers (P)
Gravity Platforms (D, P)	Onshore Processing Facilities (P)
Pile-Supported Platforms (D,P)	Sea Terminals (P)
Floating Drilling Vessels (E)	Logistics (work boats, barges,
Gravel Islands (D,P)	helicopters, etc. E,D,P)
Pipelines (P)	Drilling (E, D)

In order to identify the degree of impact the various hazards would have on specific facilities and/or activities, a matrix table (Table 1) was

developed in which the hazards were classified according to the following criteria:

N - The phenomenon is <u>not a hazard</u> to the facility

L (low) - The phenomenon could result in minor damage if not adequately considered in the design and emplacement of a facility or the application of some activity.

M (moderate) - The phenomenon could cause moderate damage if not adequately considered in the design and deployment of a facility or the application of some activity. Requires moderate effort to counter the hazard.

H (high) - The phenomenon could cause major damage if not adequately considered in the design and deployment of a facility or the application of some activity, or it requires a great degree of effort to counter the hazard.

NK - It is <u>not known</u> to what degree the phenomenon is likely to be a hazard to a facility or activity owing to a lack of information.

A. Ice Forces.

As used here, ice forces refers to floating ice which does not encounter the sea floor or to shorefast ice. Norton Sound is primarily impacted by pack ice and to a lesser extent by shorefast ice during the late fall, winter, and spring months. Ice thicknesses of 1 meter and flow rates of 15 to 25 km per day are commonly encountered in the area. In some areas the ice undergoes compression in response to southerly winds, which results in ridging. A major ice zone extends through the proposed lease tracts.

A1. <u>Jack-Up Rigs</u> - Since these rigs are to be used only during the ice-free summer months, ice forces are not a problem.

A2. <u>Gravity Platforms</u> - A moderate hazard level exists; some effort is needed insofar as taking the ice thickness, flow velocity, and ridge keel strength into account for the design criteria.

A3. <u>Pile-Supported Platforms</u> - A moderate hazard level exists; effort must be expended to properly design the platform to counter the ice forces.

A4. <u>Floating Drilling Vessel</u> - A moderate hazard level exists. Consideration must be given to ice thickness and flow velocity in the positioning of these vessels.

A5. <u>Gravel Islands</u> - Low to moderate hazard.

A6. <u>Pipelines</u> - Not a hazard, unless they are not adequately buried at and near the shoreline.

A7. <u>Tankers</u> - Moderate to high hazard owing to ice thickness and flow velocity.

A8. <u>Onshore facilities</u> - Low hazard. Could be a high hazard if facilities were placed close to the shoreline where ice over-ride onto the beach would become a hazard.

A9. <u>Sea terminals</u> - Moderate hazard.

A10. <u>Logistics</u> - Moderate hazard, in that considerable concern must be given to ice conditions and flow rates.

A11. <u>Orilling</u> - Ice forces are not considered to be a hazard because drilling itself would not be attempted if the drilling platform was threatened by ice forces.

B. Ice Gouging.

Ice gouging is common to varying degrees in water depths of 10 to 20 m, and is particularly pronounced in the central and southwestern parts of Norton Sound. Of the 11 facilities and activities considered here, ice gouging is a hazard only insofar as pipelines are concerned. Synergistic effect of ice gouging such as the removal of rip-rap from the base of structures may expose such installations to current scour.

C. Icing.

Icing conditions present a hazard primarily in respect to work boats and service vehicles where the hazard is rated as moderate. It could, in the case of the floating drilling vessel, also present some degree of hazard to the work performed from this type of vessel.

D. Faulting.

Numerous faults transect Norton Sound, many of which result in scarps exposed on the present seafloor indicating to some degree that faulting is relatively recent.. At this time, little is known about the fault activity in this area. A very high hazard exists to any land or seafloor mounted installation placed on a fault along which movement might take place. For this reason, faulting is considered as a high hazard for most of the facilities considered here. The actual drilling process in an area of active faulting is also considered a high hazard owing to possible disruption to the integrity of the well and displacement of the drill string.

Only in the case of such facilities as floating drilling vessels, tankers, and work boats, which are not mounted to the seafloor, is faulting

not considered to be a hazard.

E. Seismicity (earthquakes) - Based on available data, seismic activity in Norton Sound is moderate, with a maximum 4.2 magnitude shock occurring in the area in the past two years. Magnitudes of 6.0 and 6.5 have been reported near the northern shoreline within the past 30 years, indicating that earthquake activity could be a significant hazard over longer term periods.

For all the land or seafloor mounted installations seismic activity is considered to be a moderate hazard. In all other cases, it is not rated as a hazard. Should seismic activity be centered at an active drilling site, a severe hazard would exist as noted in regard to faulting.

F. Liquefaction.

Owing to various causes excess pore pressure may be created in a submarine deposit so as to cause a loss of sediment cohesion and a liquifying of the material down to depths of 10 meters below the seafloor. Such a loss of strength creates a hazard in Norton Sound to varying degrees.

F1. Jack-Up Rigs. Moderate hazard; except legs of most rigs can be jetted into the sediment to a depth below which liquefaction does not appear to occur.

F2. Gravity Platforms. Moderate hazard; although the liquefiable sediments can be excavated from the site prior to installation of the platform.

F3. Pile-Supported Platform. Low hazard because piles would penetrate through the liquefiable layer. The liquified sediments could, however, lend themselves to ready erosion and thus present potential footing problems.

F4. Gravel Island. Low hazard because loading would be slow and drainage to relieve excess pore pressure would be allowed through the overlying gravel.

F5. Pipelines. High hazard owing to the loss of foundational support as a result of liquefaction.

F6. Sea Terminal. Moderate hazard since such a terminal would most likely be bottom mounted.

F7. Other non-bottom mounted facilities. Other facilities such as floating drilling vessels, tankers, and work boats would not be effected by liquefaction. Since drilling would be at much greater depths than the liquefaction zone it would not be hampered by liquefaction.

G. Wind and Waves.

Available data indicate that wind and wave conditions present a moderate hazard to a majority of the facilities and activities associated with OCS development in Norton Sound.

G1. Jack-Up Rigs. Low hazard due to the low wave loading characteristics of these rigs.

G2. Tankers and Onshore Facilities. Low hazard in that these conditions are relatively easy to cope with.

G3. Pipelines and Drilling. No hazard.

H. Storm Surge.

In Norton Sound, storm surge has been known to raise the water level up to 5 meters. Ice is associated with such surges during winter months. At such times the movement of ice across the shore zone may present

a severe hazard to various installations located in this area. Ice associated with such surges presents a greater hazard than the movement of the water itself. Storm surge is considered a moderate hazard for all but three of the facilities and/or activities (pipelines, drilling, and logistics). In the case of work boat moorings, storm surge could present a considerable hazard if personnel are not alert.

I. Current Scour.

Erosion of the seafloor by bottom currents causes serious foundation problems for all bottom-mounted installations and thus is considered a high hazard for gravity platforms and pipelines and a moderate hazard for other bottom-founded facilities such as jack-up rigs, pile-supported platforms, gravel islands and sea terminals. Current scour is not a hazard for those facilities which are not dependent upon the seafloor for support.

J. Sediment Sheet Flow.

Mass movement of sediment from the near-shore out into deeper water by means of a sheet flow along the bottom commonly occurs in Norton Sound, generally as a result of storm surge. The rapid downslope movement of sediment along the bottom is primarily a high hazard to pipelines because of the lateral load that would be placed on a pipeline exposed at the seafloor. Such sheet flows could be a moderate hazard to facilities near the shore owing to the rapid erosion of sediment from the nearshore area. Sheet flows do not present a hazard to any of the other facilities or activities considered here.

K. Sand Waves.

Migration of sizeable quantities of sand along the seafloor in the form of large waves or dunes, up to several meters high off Port Clarence, create foundation problems for certain bottom-mounted installations if the sand waves are extremely high. In the immediate area of Norton Sound sand waves thus far observed are only about 50 cm high. Such waves would present only a moderately low hazard to pipelines and not any hazard to any of the other facilities or activities considered here.

L. Biogenic Gas

Peats and organic-rich sediments blanketed by recent sediments underly portions of Norton Sound, particularly off the Yukon Delta in the central part of the Sound. Decomposition of the organic material results in high concentrations of methane gas at rather shallow depths below the sea floor. These gas-charged sediments display distinctly lower shear strength than deposits without gas which is the major hazard associated with these sediments. Escape of the gas often causes craters to form at the seafloor which contributes to bottom roughness and the potential for current scour.

These gas-charged sediment, owing to their reduced shear strength, present potential foundation problems for any bottom dependent facility. The hazard level is high for installations such as gravity platforms and sea terminals which depend upon the upper few meters of the seafloor for their bearing capacity. A moderate hazard level is expected in conjunction with jack-up rigs, gravel islands, and pipelines which may in some cases gain the required bearing capacity from deposits underlying the gas-charged sediments. Gas-charged sediments are considered to be a relatively minor

permafrost may exist, and is a moderate hazard to onshore facilities. It does not present a hazard to offshore facilities.

P. Sediment Sensitivity.

The ratio between the natural (undisturbed) sediment shear strength and the remolded (disturbed) shear strength provides an indication of the susceptibility of a deposit to lose its strength due to a disturbing force such as a seismic shock and is referred to as sensitivity. In an area of seismic activity, sediment sensitivity could be a major factor in defining the stability characteristics of the sea floor deposits. The degree to which sediment sensitivity may present a hazard to OCS exploration and development is unknown owing to the lack of adequate geotechnical information.

II. STATUS OF TECHNOLOGIES TO COPE WITH ENVIRONMENTAL HAZARDS

In addition to defining the severity of various hazards on the facilities and activities essential to OCS exploration and development an attempt is made here to assess the status of technologies available to cope with the respective hazards in light of the facilities and activities involved. This assessment is noted in the lower right-hand corner for each item in the hazards-facilities matrix (Table 1) and is based on the following criteria:

0 - Technology is presently available to cope with the hazard and has been successfully used elsewhere.

1 - Technology is not presently available but is expected in less than five years. (short term)

2 - Technology is not available but is expected in the next five to ten years. (long term)

hazard to pile-supported platforms because the piles commonly penetrate to depths below the weakened deposits.

M. Thermogenic Gas.

Migration of CO_2, derived from a hydrocarbon source, has resulted in the presence of highly charged gaseous sediments over a zone 9 Km in diameter south of Nome. These gas-charged sediments reach to depths considerably greater than those affected by biogenic gas and also possess much greater pressures. The hazard here is in respect to the foundational properties of the sediment similar to that found with biogenic gas but more so. The higher gas pressures and the possibility of releasing these gases quickly presents a very serious foundation problem as well as the possibility of blow out and explosion. For this reason, such a gas-charged area presents a very high hazard to any bottom dependent facility or activity. Thermogenic gas charging is a localized problem, which when defined, can be avoided.

N. Coastal Erosion.

Only in the case where facilities are located at the interface between the land and the sea is there a hazard due to erosion. To pipelines which must cross this zone the hazard level is low because they are commonly trenched to avoid this problem. Coastal erosion may present a high hazard to onshore facilities if such installations are not situated so as to take into consideration this potential problem.

O. Permafrost.

Although permafrost is found onshore, studies to date indicate a low likelihood for its existence offshore in Norton Sound. Permafrost is a minor potential hazard to buried pipelines which cross the shore zone where

A. Ice Forces.

Designs are available for gravity platforms, floating drilling vessels, and tankers for coping with this hazard, but further advancement is required to address this hazard in Norton Sound. Appropriate technology is expected to be available in the short term.

Suitable technology for sea terminals in ice is not now available, the difficulty being problems with the approaching and loading of tankers. Adequate technology is expected in the next 5 to 10 years.

B. Ice Gouging.

Pipelines are the only facility to which ice gouging is identified as a hazard. Technologies are available to trench pipelines below the 1 to 2 meter depth commonly gouged by ice in Norton Sound.

C. Icing.

Technologies are available for coping with icing conditions as are the common operational procedures for dealing with this hazard.

D. Faulting.

Faulting hazards can be eliminated from consideration if the locations of active faults are known, by locating a facility away from the fault. Since pipelines will have to cross faults in Norton Sound to reach any shore facility, the faulting hazard cannot be totally avoided. Technologies capable of addressing the problem of placing pipelines across active faults is expected in less than five years.

E. Seismicity.

Technologies are available and in use for coping with the moderate levels of earthquake ground motion expected in Norton Sound.

F. Liquefaction.

The technology and procedures for placement of most installations on the seafloor are such that the hazard from liquefaction is eliminated. In those cases where bottom installations are dependent on the upper few meters of the seafloor for the required bearing capacity, technologies to cope with the problem of liquefaction are not adequately developed but are expected to be available in the near future.

G. Wind and Waves.

Technologies are available and in use for coping with most of the wind and wave conditions expected in Norton Sound. Under the very few severe conditions that cannot be handled by existing technology, the operation would normally be shut down until conditions improve.

H. Storm Surge.

Current technology is available to cope with expected surge levels.

I. Current Scour.

Present technology is capable of coping with potential current scour problems in relation to the various facilities and activities being considered for Norton Sound. Technologies to counter the impact of current scour on pipelines may be lacking at this time, simply because the needed technology cannot be ascertained until more is known about the susceptibility

of currents to scour deeper where trenching has taken place. The assumption is made that should there be a lack of appropriate technology it would be available in a relatively short time.

J. Sediment Sheet Flow.

Current technology is available to address this problem.

K. Sand Waves.

Present technology is available to deal with problems encountered because of sand waves of the scale reported in Norton Sound. (Sale 57 and associated pipeline routes).

L. Biogenic Gas.

Technologies as related to most of the facilities and activities considered necessary for exploration and development of Norton Sound are available to handle the potential hazards attributed to shallow occurrences of methane gas. Only in those cases (gravity platform, gravel island, pipelines, and sea terminals) where an installation is dependent to some degree on the foundational characteristics of the upper few meters of the seafloor (gas-charged zone) for its stability is there a need for improved technology to cope with this problem. Advanced technology may also be needed in regard to the use of jack-up rigs in close proximity to the Yukon Delta where the gas-charged sediments may occur at depths greater than jack-up rigs are capable of jetting. In all these cases technologies are expected to be available in less than 5 years.

M. Thermogenic Gas.

The localized occurrence of thermogenic gas can usually be avoided insofar as drilling is concerned by positioning the drilling operation a safe distance away. However, the possibility of a blow-out during drilling does exist and although technologies are available to address such a problem, there is a need for greater improvement of these technologies and they are anticipated in less than 5 years.

N. Coastal Erosion.

Technologies are presently available to cope with this potential problem.

O. Permafrost.

Present technologies are capable of countering potential problems in this area.

P. Sensitivity.

Sufficient data are not presently available to evaluate the severity of the problem and, therefore, the state of current technologies to cope with potential problems in this area cannot be assessed.

IV. ADDITIONAL DATA NEEDS TO ADDRESS ENVIRONMENTAL HAZAROS IN NORTON SOUND

In an attempt to assess the severity of environmental hazards as they might impact various facilities and or activities necessary for petroleum exploration and development in Norton Sound consideration was also given to the present state of knowledge upon which documentation of these hazards

is based. A rating scale of 0 to 2 was used (upper left-hand corner in hazard-facilities matrix) based on the following criteria: (a) sufficient data are available to define the hazard (0), (b) additional data are needed to better define the hazards, but they are not critical to the lease sale (1), (c) additional data are critical to define the hazards prior to the lease sale (2).

A. Ice Forces.

Additional information is needed regarding the velocity of ice movement, ice thickness distribution, and the movement of ice up onto the shore. Although not critical to the lease sale, these additional data are needed to address potential ice hazards in respect to gravity platforms, sea terminals, and onshore facilities.

B. Ice Gouging.

Sufficient data are available.

C. Icing.

Adequate data are available.

O. Faulting.

Although considerable data exists on the location of faults, additional definition of the fault system(s) in Norton Sound is necessary. This can probably be attained from the interpretation of existing data. Of greater need is the documentation of fault activity. Little or no information is available which addresses the question of how active are the faults. Data is required to determine whether there has been recent movement along the faults or if they are inactive. This need for information is important, but is not

critical to the lease sale because the potential hazard can be defined and coped with prior to drilling.

E. Seismicity.

The data base for defining the magnitude and frequency of seismic events is not sufficiently developed to adequately document the potential earthquake hazard. Although ground acceleration associated with seismic events does not appear to be a particular problem for seafloor-mounted facilities, seismic data are needed to assess the severity and frequency to which sediment sensitivity and liquefaction may be impacted by seismic events. Seismicity studies are also particularly relevant to the evaluation of fault activity.

F. Liquefaction.

The available geotechnical data appear inadequate to evaluate the liquefaction problem in Norton Sound. Additional geotechnical studies on high grade sediment cores should be undertaken as should in place pore pressure measurements.

G. Wind and Waves.

Adequate information is not yet available for Norton Sound so as to predict the various limits to be expected from this hazard. Better weather forecasting will be required in the Norton Sound area.

H. Storm Surge.

Sufficient information on storm surges does not exist for Norton Sound for the adequate documentation of the severity of this potential hazard.

I. Current Scour, Sediment Sheet Flow, and Sand Waves.

Sufficient data exist to define the extent, distribution, and frequency

of these processes which impact various facilities placed on the seafloor.

J. Biogenic Gas.

Additional data is needed to better define the depth and occurrence of gas-charged sediments. The gas-charged zone may be considerably deeper in the vicinity of the Yukon Delta relative to other parts of Norton Sound. This in turn may create hazards not evident from the shallow occurrences of gas-charged sediments reported thus far. A much better understanding of the effects which gas-charging has on the geotechnical properties of the substrate is critical to defining the foundational characteristics of these deposits.

K. Thermogenic Gas.

Adequate data are available to define the location and extent of thermogenic gas accumulation.

L. Coastal Erosion.

Sufficient data are available to document this potential hazard.

M. Permafrost.

Additional data are required to define the distribution of onshore permafrost relative to possible pipeline crossings of the shore zone and for the design of onshore facilities.

N. Soil Sensitivity.

The geotechnical data base for Norton Sound is inadequate to determine the potential hazards due to the sensitivity (degree of strength loss due to shock or disturbance) of the seafloor deposits. Additional study is needed, but it is not critical to the lease sale.

V. HAZARD IMPACT RELATIVE TO PROPOSED LEASE TRACT OPTIONS

The wide spread distribution of the identified environmental hazards throughout Norton Sound indicates that relatively few can be totally eliminated by deleting various groups of tracts from the sale. (See Figure 1)

- Alternative 1 (Northern tracts). Removal of this portion of the tract would eliminate or greatly reduce two hazards. Thermogenic gas problems as related to offshore platforms and drilling activity would be totally eliminated. This hazard would still need to be considered insofar as future pipeline routes to Nome. The biogenic gas hazard, based on the known distribution of gas-charging, would be also largely removed if this portion of the tract was dropped from the sale.

- Alternative 2 (Eastern tracts). Deletion of the eastern portion of the lease tract would eliminate the biogenic gas hazard based on the present understanding of the distribution of gas-charged sediments.

- Alternative 3 (Southern tract). Exclusion of the southernmost part of the tract would not eliminate any of the hazards considered here.

- Alternative 4 (Western tract). Deletion of the western portion of the tract would eliminate the thermogenic gas hazard to offshore platforms and drilling. All of the other hazards would still need to be considered.

In general, the most severe combination of hazards exists in the southern and southwestern sectors of the lease area, whereas the hazards in the northern half are less severe or can be dealt with more easily.

Elimination of the southern tract does not eliminate any one of the environmental hazards from consideration; however, deletion of this portion

Figure 1.

of the tract would eliminate most of the severe problems due to ice gouging, current scouring, and intense storm surge activity.

VI. SUMMARY OF HAZARD IMPACT ON NORTON SOUND EXPLORATION AND DEVELOPMENT

Based on the material presented here and that summarized in Table 1, the following generalizations appear to reflect the severity of various hazards in relation to facilities and/or activities necessary to carry out petroleum exploration and development in Norton Sound.

- Hazards which present the greatest problem areas considering inadequate technologies or data, in order of severity:

1. Ice forces
2. Biogenic gas charging
3. Liquefaction

- Hazards that least impact OCS development and or can be handled with existing technology, in order of decreasing impact:

1. Permafrost
2. Coastal erosion
3. Icing
4. Ice gouging
5. Sediment sheet flow
6. Sand waves

- Facilities and or activities most severely impacted by environmental hazards:

1. Pipelines

- Facilities and or activities least impacted by hazards, in order or decreasing impact:

1. Jack-up rigs
2. Onshore processing facilities
3. Floating drilling vessel
4. Tankers
5. Logistics (workboats, helicopters)
6. Drilling

VII. CONCLUSIONS

An analysis of environmental hazards to petroleum exploration and development activities in Norton Sound reveals that 16 such hazards may constitute potential problems for a number of the facilities and activities needed for such an effort in Norton Sound. Of the 16 hazards, faulting activity and thermogenic gas-charged sediments present the greatest hazards. Fortunately, in the case of both of these hazards, once they are located and the degree of activity defined, the hazard can be taken into consideration and procedures used so as to make the hazard a nonproblem. In light of the capabilities of presently available technologies there are, however, three environmental hazards which could present severe problems to facilities and activities associated with the Norton Sound development. These are ice forces, biogenic gas-charged sediments, and liquefaction of seafloor deposits. Indications are that there will be technologies forthcoming in the next five years to render these as nonhazards. Until then, however, these hazards must receive serious consideration.

Of the facilities and/or activities proposed for Norton Sound, pipelines are most vulnerable to impact from the greatest number of hazards. In most cases, the hazard can be overcome by available technologies and the remainder are expected to be addressed by new technologies which should be developed in less than five years.

In considering the 16 hazards versus the 11 facilities and/or activities necessary for exploration and development in Norton Sound, it was found that in the majority of the cases (92%) present technologies are available to cope with the respective hazard and in 7% of the cases adequate technologies should be available in less than 5 years. In only one case, ice forces on sea terminals, will the new technologies needed to address this problem require more than 5 years to develop.

Although extensive studies have been made to identify and document the environmental hazards, it is clear from this review that inadequacies exist in the available data to provide sufficient information to effectively delimit a number of the environmental hazards relevant to Norton Sound.

Data are particularly lacking in regard to the following hazards:

- Faulting (activity)
- Seismicity
- Liquefaction
- Wind and waves
- Storm surge
- Biogenic gas-charging
- Sediment sensitivity

Although a number of studies have dealt with the geotechnical properties of the bottom sediments, efforts designed specifically to address the liquefaction and sensitivity properties of these deposits are needed in order to define the stability characteristics of the seafloor

Owing to the large number and distribution of environmental hazards identified in Norton Sound, it is not possible to eliminate all the hazards by deletion of any particular portion of the proposed lease area. Exclusion of the southern half of the area would, however, probably eliminate the greatest number of hazards from consideration.

APPENDIX E

BIOLOGICAL OPINION
ON ENDANGERED BIRDS

Requested by
The Alaska OCS Office

Prepared by
Fish and Wildlife Service

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES BLM/GS-80-2

SEP 16 1980

Memorandum

To: Director, Bureau of Land Management
Director, U.S. Geological Survey

From: ACTING Director

Subject: Revision of August 22, 1980, Biological Opinion Regarding Outer Continental Shelf (OCS) Oil and Gas Leasing and Exploration Activities in the Bering Sea Region

Recent information from Dennis Money, Alaska Area Office, indicates that the peregrine nesting survey in the Sale #57 (Norton Basin) area of the Bering Sea cannot be accomplished for 1980. Therefore, the subject biological opinion should be amended to read as follows:

1. Page 1. Paragraph 2. Delete lines 7-12 "There is limited knowledge... formal consultation must be reinitiated."

2. Incorporate the following statements as the first paragraph on page 3.

   To assist you in exercising your authority for the conservation of listed species, the following actions are recommended:

   a. Aircraft supplying and servicing exploration activities must maintain at least 1500 feet altitude above nest level within 1 mile horizontal distance of peregrine falcon eyries identified in past surveys in the Sale #57 (Norton Basin) area. The U.S. Fish and Wildlife Service, Alaska Area Office, should be contacted to determine the location of these historical eyries.

   b. A complete updated survey delineating current peregrine nesting areas in the Sale #57 area should be completed no later than October 1981. If nesting birds are present this formal consultation must be reinitiated.

The revised biological opinion is attached.

/s/ Harold J. O'Connor

Attachment

cc: Directorate Reading File
LD Chron File - ATA File
OES Reading - OES Surname - OES Chron
FWS/OES:Lwest:mc:235-2760 8-27-80

Neither the short-tailed albatross nor the Eskimo curlew have been recently reported in or near the Bering Sea Sale areas. Probably the most vulnerable habitat of the Aleutian Canada goose would be Buldir Island. However, net transport of oil spills in this region would likely be northward, away from Buldir Island. In addition, large distances between Buldir Island and the lease areas would allow substantial weathering of spilled oil. Thus, there appears to be little chance of spilled oil reaching Buldir Island, the only known nesting area for the species. Therefore, the only species included in this biological opinion are the American and Arctic peregrine falcons (Falco peregrinus anatum and F. p. tundrius), for which a summary of the biological data is provided below.

American and Arctic Peregrine Falcons (Falco peregrinus anatum and F. p. tundrius)

The peregrine is a medium-sized falcon. Both of these subspecies have been listed as Endangered since 1970 and Critical Habitat for the American falcon has been designated in California.

The principal cause of the peregrine's decline has been contamination by chlorinated pesticides. Other factors contributing to their decline include shooting, predation (by great horned owls in particular), egg collecting, disease, falconers, human disturbance at nesting sites, and loss of habitat to human encroachment.

The Arctic peregrine breeds in the North American tundra, and migrates mainly along the east coast where it is the most common of the two subspecies. While a few pair of American peregrines still breed in Labrador, the Eastern U.S. population of American peregrines is considered to have been extirpated. However, as a result of the captive breeding program at Cornell University, peregrine falcons have been reintroduced in the northeastern U.S. There are indications that this reintroduction effort may be successful, and that someday breeding pairs may again occur in the eastern U.S.

During migration, coastal habitats are used extensively by peregrine falcons. Peregrines can also be found as far as 300 miles offshore during the migration period. Since they are capable of feeding while in flight, it is possible that spills which remain offshore can result in the oiling of peregrines or their prey. In addition, peregrines which rest on beaches during migration may become oiled. The probability of a spill occurring during exploration activities, however, is very remote. The expansion of existing facilities, the establishment of new facilities, or the construction of gravel islands may impact this species and will require reinitiation of consultation before a Corps of Engineers Section 10 permit can be issued.

Since nesting and migration areas are relatively distant from the project area and the potential for an oil spill resulting from exploration activities is small, it is my biological opinion that the proposed oil and gas leasing and exploration activities associated with proposed OCS Sales 57, 70, 75, and 83 are not likely to jeopardize the continued existence of the listed species considered herein, and because there is no designated Critical Habitat within or near the project area, Critical Habitat will not be affected.

In Reply Refer To:
FWS/OES BLM/GS-80-2

Memorandum

To: Director, Bureau of Land Management
Director, U.S. Geological Survey

From: Director

Subject: Biological Opinion Regarding Outer Continental Shelf (OCS) Oil and Gas Leasing and Exploration Activities in the Bering Sea Region

By memorandum received June 6, 1980, the Bureau of Land Management (BLM) and the U.S. Geological Survey (GS) requested a joint formal consultation on the proposed Outer Continental Shelf (OCS) oil and gas program in the Bering Sea region. Four proposed OCS lease Sales are scheduled to take place in this region between September 1982 and December 1984. This consultation considers oil and gas leasing and exploration activities in the area that encompasses proposed Sales 57 (Norton Basin), 70 (St. George Basin), 75 (Northern Aleutian Shelf), and 83 (Navarin Basin). By memorandum dated June 19, 1980, a list of four species which may be affected by the OCS programs was received from the BLM Alaska OCS Office, including the American and Arctic peregrine falcons (Falco peregrinus anatum, F. p. tundrius), short-tailed albatross (Diomedea albatrus), Aleutian Canada goose (Branta canadensis leucopareia), and Eskimo curlew (Numenius borealis).

Through informal consultation, agreement was made that the only "may affect" situation associated with the leasing and exploration activities would be for Sale #57 (Norton Basin). The effect would be possible disturbance of nesting peregrines along the coast near Nome by aircraft (primarily helicopters) supplying and servicing exploration activities. Similar work activities involving support and supply bases in Dutch Harbor, Cold Bay, and St. Paul will not adversely affect listed species or associated Critical Habitat.

Neither the short-tailed albatross nor the Eskimo curlew have been recently reported in or near the Bering Sea Sale areas. Probably the most vulnerable habitat of the Aleutian Canada goose would be Buldir Island. However, net transport of oil spills in this region would likely be northward, away from Buldir Island. In addition, large distances between Buldir Island and the lease

To assist you in exercising your authority for the conservation of listed species, the following actions are recommended:

1. Aircraft supplying and servicing exploration activities must maintain at least 1500 feet altitude above nest level within 1 mile horizontal distance of peregrine falcon eyries identified in past surveys in the Sale #57 (Norton Basin) area. The U.S. Fish and Wildlife Service, Alaska Area Office, should be contacted to determine the location of these historical eyries.

2. A complete updated survey delineating current peregrine nesting areas in the Sale #57 area should be completed no later than October 1981. If nesting birds are present this formal consultation must be reinitiated.

Should the use or expansion of other facilities be proposed or should the initiation of activities (such as the construction of gravel islands for exploration purposes) not specifically mentioned in this consultation be proposed, reinitiation of Section 7 consultation will be required. Since development/production activities may affect listed species, Section 7 consultation will be required before this phase is entered. If a new species which may be affected should be listed, or additional pertinent information becomes available, or the project description change, Section 7 consultation must be reinitiated.

We would like to thank BLM and GS for their consideration in providing the necessary information needed to conduct this consultation.

United States Department of the Interior

ADDRESS ONLY THE DIRECTOR, FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

AUG 22 1980

In Reply Refer To:
FWS/OES BLM/GS-80-2

Memorandum

To: Director, Bureau of Land Management
Director, U.S. Geological Survey
Associate
From: Director

Subject: Biological Opinion Regarding Outer Continental Shelf (OCS) Oil and Gas Leasing and Exploration Activities in the Bering Sea Region

By memorandum received June 6, 1980, the Bureau of Land Management (BLM) and the U.S. Geologicel Survey (GS) requested e joint formal consultation on the proposed Outer Continental Shelf (OCS) oil and gas program in the Bering Sea region. Four proposed OCS lease Sales are scheduled to take place in this region between September 1982 and December 1984. This consultation considers oil end gas leasing and exploration activities in the area that encompasses proposed Sales 57 (Norton Basin), 70 (St. George Basin), 75 (Northern Aleutian Shelf), and 83 (Navarin Basin). By memorandum dated June 19, 1980, a list of four species which may be affected by the OCS programs was received from the BLM Alaska OCS Office, including the American and Arctic peregrine falcons (Falco peregrinus anatum, F. p. tundrius), short-tailed albatross (Diomedea albatrus), Aleutian Canada goose (Branta canadensis leucopareia), and Eskimo curlew (Numenius borealis).

Through informal consultation, agreement was made that the only "may affect" situation associated with the leasing and exploration activities would be for Sale #57 (Norton Basin). The effect would be possible disturbance of nesting peregrines along the coast near Nome by aircraft (primarily helicopters) supplying and servicing exploration activities. Similar work activities involving support end supply bases in Dutch Harbor, Cold Bay, and St. Paul will not adversely affect listed species or associated Critical Habitat. There is limited knowledge concerning current peregrine nesting areas in the Bering Sea region. However, BLM will be supplying such information by conducting a survey in the Sale #57 area this summer and the results of that survey should be aveilable by September or October at the latest. If nesting birds are present this formal consultation must be reinitiated.

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Neither the short-tailed albatross nor the Eskimo curlew have been recently reported in or near the Bering Sea Sale areas. Probably the most vulnereble habitat of the Aleutian Canada goose would be Buldir Island. However, net transport of oil spills in this region would likely be northward, away from Buldir Island. In addition, large distances between Buldir Island and the lease areas would allow substantial weathering of spilled oil. Thus, there appears to be little chance of spilled oil reaching Buldir Island, the only known nesting area for the species. Therefore, the only species included in this biological opinion are the American and Arctic peregrine falcons (Falco peregrinus anatum and F. p. tundrius), for which a summary of the biological data is provided below.

American and Arctic Peregrine Falcons (Falco peregrinus anatum and F. p. tundrius)

The peregrine is a medium-sized falcon. Both of these subspecies have been listed as Endangered since 1970 and Critical Habitat for the American falcon has been designated in California.

The principal cause of the peregrine's decline has been contamination by chlorinated pesticides. Other factors contributing to their decline include shooting, predation (by great horned owls in particular), egg collecting, disease, falconers, human disturbance at nesting sites, and loss of habitat to human encroachment.

The Arctic peregrine breeds in the North American tundra, and migrates mainly along the east coast where it is the most common of the two subspecies. While a few pair of American peregrines still breed in Labrador, the Eastern U.S. population of American peregrines is considered to have been extirpated. However, as a result of the captive breeding program at Cornell University, peregrine falcons have been reintroduced in the Northeastern U.S. There are indications that this reintroduction effort may be successful, and that someday breeding pairs may again occur in the Eastern U.S.

During migration, coastal habitats are used extensively by peregrine falcons. Peregrines can also be found as far as 300 miles offshore during the migration period. Since they are capable of feeding while in flight, it is possible that spills which remain offshore can result in the oiling of peregrines or their prey. In addition, peregrines which rest on beaches during migration may become oiled. The probability of a spill occurring during exploration activities, however, is very remote. The expansion of existing facilities, the establishment of new facilities, or the construction of gravel islands may impact this species and will require reinitiation of consultation before a Corps of Engineers Section 10 permit can be issued.

Since nesting and migration areas are relatively distant from the project area and the potential for an oil spill resulting from exploration activities is small, it is my biological opinion that the proposed oil and gas leasing and exploration activities associated with proposed OCS Sales 57, 70, 75, and 83 are not likely to jeopardize the continued existence of the listed species considered herein, and because there is no designated Critical Habitat within or near the project area, Critical Habitat will not be affected.

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Should the use or expansion of other facilities be proposed or should the initiation of activities (such as the construction of gravel islands for exploration purposes) not specifically mentioned in this consultation be proposed, reinitiation of Section 7 consultation will be required. Since development/production activities mey affect listed species, Section 7 consultation will be required before this phase is entered. If a new species which may be affected should be listed, or additional pertinent information becomes available, or the project description change, Section 7 consultation must be reinitiated.

We would like to thank BLM and GS for their consideration in providing the necessary information needed to conduct this consultation.

Ronald E. Lambertson

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APPENDIX F

SUMMARY OF MINIMUM AND MAXIMUM IMPACTS

Prepared by
The Alaska OCS Office

Summary of Minimum and Maximum Impacts

The environmental impacts from proposed lease sale 57 are based on the mean case, which represents a middle ground in the range of potentially recoverable oil and gas resources estimated for the proposed lease sale area. The minimum and maximum cases are the extremes of the resource estimate range. Potentially recoverable resources (total production of the field) are estimated to range from 90 to 1520 million barrels of oil and from 90 to 5040 billion cubic feet of gas. The following summarizes the possible environmental impacts for major issues that could derive from the minimum and maximum cases, based on the developmental scenarios established for the respective quantities of potentially recoverable resources.

A. Minimum Case:

1. Impacts on Population, Subsistence, and Village Livelihood: Under the minimum case, oil resources are equivalent to those expected under Alternative V (eastern deletion), but gas resources are virtually non-existent and presumably uneconomical to recover. Offshore loading would presumably apply. (See the discussion under the eastern deletion alternative, Sec. IV.F.1.) Impacts on subsistence would be minimized, assuring a moderation of fish and game competition, destruction of habitat, and stress on subsistence leadership. Population impacts would be the same or smaller than those discussed for the eastern deletion (Alternative V). Employment opportunities for this low case for local residents would also be minimal.

2. Impacts on Sociocultural Systems: Impacts of the minimum case for the proposal and the alternatives on cultural and sociocultural resources would be low.

3. Impacts on Urban Infrastructure: Under the low case, the population increase in Nome would likely be similar to the forecast for Alternative V, eastern deletion. (Refer to the discussion of Alternative V, eastern deletion in Section IV.F.1.e.)

4. Impacts on Fish Resources: A decrease in estimated recoverable reserves of oil and gas from that of the proposal would reduce oilspill risk probability from the already very low probability to virtually nil. Fewer exploratory wells and production platforms would significantly reduce material and labor requirements from this rather remote area of northwestern Alaska.

5. Impacts on Commercial Fishing: A decrease in expected oil and gas from the proposal would also result in fewer wells drilled and a smaller overall area impacted. Oilspill risk probability, fixed fishing gear and oil vessel/structure conflicts would be reduced to the point where already minimal adverse impacts would become negligible.

6. Impacts on Birds: The significant reduction in hydrocarbon deposits assumed in the minimum case would probably result in less chance of oilspills occurring and affecting marine and coastal birds and their habitats. Fewer numbers of birds may be affected by oil pollution and disturbance than described in the mean case of the proposal. Substantial effects on local or regional populations are unlikely.

7. Impacts on Endangered Species and Marine Mammals: Overall impacts on endangered species and marine mammals from direct and indirect effects of oilspills or disturbance associated with development and transport of extracted oil would probably be less than described for the proposed sale (mean case), since spill rates and volume of oil transported would, presumably, be reduced. Short term localized effects could occur, however, in the event of an oilspill. Industrial activity during migratory periods in westernmost blocks could still pose spill risks and/or potentially disturb population segments of marine mammals and endangered species, regardless of the absolute level of petroleum resource estimates.

8. Impacts on State, Regional, and Local Economies: The impacts on state, regional, and local economies in terms of increased employment and population would be very much reduced in comparison to the mean case. The total employment impact in the Nome census division, where almost all of the new jobs would occur, would peak in 1985 at an estimated 760 jobs, contrasted to the mean case in which the employment impacts would peak in 1988 at an estimated 4393 jobs. These figures include not only the jobs in oil and gas activities, but also the additional employment in retail trade and services, local government, and other categories of jobs created as indirect effects of OCS development. Also included in these employment figures are the commuters (workers who would reside outside of the Nome area during periods of rest and recreation). If the commuters are excluded from the employment comparison, OCS impact employment in the minimum case would peak in 1988 at an estimated 172 jobs contrasted to the mean case in which the employment impact would peak in 1988 at an estimated 1481 jobs caused directly or indirectly by OCS activities.

For analytical purposes, it is useful to know the expected employment impacts both with and without the commuters included, because the impact of the commuters on the local economy would be relatively minor. Commuters would live in company dormitories either offshore or at an enclave several miles distant from the present city limits of Nome during their on-duty periods, and would fly to residences far removed from Nome during periods of rest. Consequently, commuters would spend very little time or money within the present city limits of Nome. Commuters would not bring dependents into the Nome area. For all these reasons, commuters are excluded from population projections used for general planning purposes, such as local government planning for education, and for most other types of services.

Excluding commuters, population impacts on the Nome census division in the minimum find case would peak at 216 persons in 1988 contrasted to the mean case in which the population impact would peak in 1988 at 3169 persons.

B. Maximum Case:

1. Impacts on Population, Subsistence, and Village Livelihood:

Under the maximum case, potential oil and gas resources are three times those of the mean case. Peak development social impacts would be heightened and lengthened over the boom town conditions already predicted under the analysis for the proposal. It is likely that with additional increments of added OCS population, the inflationary spiral, severe housing problems, and crowded conditions in all services and facilities would force industry to house addi-

tional workers at industrial enclave facilities and maintain tighter control over their off hours behavior, as is typical at larger industrial and military facilities in Alaska. Assuming these facilities are already provided at Cape Nome under the mean case (Alternative I), their expansion could further erode the environmental quality of this site, with corresponding effects on subsistence use. Expansion of industrial facilities and lengthened development could expand job opportunities for local residents of the region, if training were provided sufficient to local needs. Certainly, under a larger and stronger boom town industrial condition, the quality of life in Nome would be fundamentally changed and the anonymity, commercialism, and individualism of the city would severely erode the communal, family-oriented lifestyles of present-day Nome.

2. Impacts on Sociocultural Systems: Impacts of the maximum case for the proposal and alternatives on cultural resources and sociocultural resources would increase impacts by about 10 percent. This 10-percent increase in impacts would be significant.

3. Impacts on Urban Infrastructure: Under the high case, the population is likely to increase dramatically over the proposal (Alternative I). With an increase in population there would likely be a concurrent increased demand made on community infrastructure and services. Most notable of these would be an extreme shortage of housing, particularly during the peak years. The increased demand for public utilities and services would be extreme, even as compared to the proposal. It is likely that Nome would be unable to finance the demand for increased utilities and services.

4. Impacts on Fish Resources: Impacts on commercial and sport fish species in the maximum case, could be greater than impacts from the proposed action, should the amount of hydrocarbons found exceed the estimated discovery of oil by a factor of about three from the proposal, 480 million barrels of oil versus 1.5 billion barrels; and in gas, an increase of 150 percent above the estimates from the proposal, 2 bcf versus 5 bcf. The increase in oil discovery would lead to increased population and hence pressure on salmonids and king crab by increased use. Additional drilling and construction could lead to habitat alteration/degradation for these species. Tankering-produced hydrocarbons would also increase oilspill risk probability.

Under the maximum case, additional wells would be drilled with a concurrent increase in logistical facilities.

5. Impacts on Commercial Fishing: Commercial fishing could be impacted to a larger extent from the proposal by increased oilspill risk probability, increased chance for conflicts between oil and gas transport, vessels and fixed fishing gear, and loss of fishing area from offshore structures on fishing grounds.

The increase in population is not likely to result in competition between the oil and fishing industries for available labor from among the local population.

6. Impacts on Birds: A three-fold increase in oil deposits assumed in the maximum case could significantly increase the chances of oilspills occurring and contacting marine and coastal bird populations and their habitats over that described in the mean case. A greater number of birds may be directly

effected by oil pollution. A significant reduction in local bird populations could occur and regional populations may also be reduced in the maximum case.

7. Impacts on Endangered Species and Marine Mammals: Overall impacts on endangered species and marine mammals due to direct and indirect effects of oilspills or disturbance associated with development and transport of extracted oil would be greater than those as described for the proposed sale (mean case). Since the maximum case assumes about three times the level of petroleum resources as estimated for the mean case, a substantial increase in spill contact probabilities for major whale and marine mammals migration/ feeding areas would be expected as compared to the mean case. Such an increase could possibly lead to measurable, long term regional effects on valuable species, especially gray whales which rely extensively on food sources immediately west of the proposed sale area and/or other species which migrate through the outer Norton Sound area. Increased noise and disturbance associated with high levels of development which would be expected with the maximum case could result in more localized changes in distribution and/or density of potentially sensitive species (e.g., ringed seals).

8. Impacts on State, Regional, and Local Economies: The impacts on state, regional, and local economies in terms of increased employment and population would be substantially increased in comparison to the mean case. The total employment impacts in the Nome census division, where almost all of the new jobs would occur, would peak in 1989 at an estimated 5847 jobs, contrasted to the mean case in which the employment impact would peak in 1988 at an estimated 4393 jobs. These figures include not only the jobs in oil and gas activities, but also the additional employment in retail trade and services, local government, and other categories of jobs created as indirect effects of OCS development. Also included in these employment figures are the commuters (workers who would reside outside of the Nome area during periods of rest and recreation). If the commuters are excluded from the employment comparision, OCS impact employment in the maximum case would peak in the year 1990 at an estimated 1686 additional jobs as contrasted to the mean case in which OCS employment impact would peak in 1988 at an estimated 1481 additional jobs caused directly or indirectly by OCS activities.

For analytical purposes, it is useful to know the expected employment impacts both with and without the commuters included, because the impact of the commuters on the local economy would be relatively minor. Commuters would live in company dormitories either offshore or at an enclave several miles distant from the present city limits of Nome during their on-duty periods, and would fly to residences far removed from Nome during periods of rest. Consequently, commuters would spend very little time or money within the present city limits of Nome. Commuters would not bring dependents into the Nome area. For all these reasons, commuters are excluded from population projections used for general planning purposes, such as local government planning for education, and planning for most other types of services.

Excluding commuters, population impacts on the Nome census division in the maximum find case would peak at 3939 persons in 1990 contrasted to the mean case in which the population impact would peak at 3169 persons in 1988.

APPENDIX G

BIOLOGICAL OPINION
ON ENDANGERED WHALES

Requested by
The Alaska OCS Office

Prepared by
National Marine Fisheries Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

Jan 22, 1982 F/MM2:CK

Mr. Robert Burford
Director
Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Dear Mr. Burford:

Enclosed is the Biological Opinion prepared by the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act of 1973 (ESA) concerning the impact of the Outer Continental Shelf (OCS) oil and gas leasing program and associated exploration activities in the Bering Sea Region on endangered whales. Activities associated with production and development will be considered in future consultations.

Based upon our evaluation of the available information concerning the biology and distribution of endangered whales and the nature, extent and location of OCS activities the National Marine Fisheries Service (NMFS) concludes that there is insufficient information to make a reliable determination concerning the likelihood of jeopardizing the continued existence of endangered whales. Despite the inconclusive Biological Opinion the NMFS believes that it is possible for the Department of the Interior (DOI) to plan OCS explortory activities in the Bering Sea Region so that they are not likely to jeopardize the continued existence of endangered whales. This belief is based in part upon DOI's intention to reinitiate consultations pursuant to Section 7(a)(2) of the ESA for future lease sales in the Bering Sea Region. The DOI should also examine additional information on OCS activities in the Bering Sea Region and on the biology and distribution of endangered whales to determine if additional Section 7 consultations are required. Our Biological Opinion includes reasonable and prudent alternatives and recommendations to assist DOI in planning OCS activities in the Bering Sea Region and fulfilling its obligations under Section 7 of the ESA.

The Biological Opinion also provides DOI with an indication of the information that NMFS must have before a reliable determination on the likelihood of jeopardy to endangered whales from OCS activities in the Bering Sea Region can be made. The NMFS is aware of the considerable research efforts on endangered whales that the Bureau of Land Management has aponsored or conducted. We applaud this effort and encourage its continuation.

Consultation also must be reinitiated if there are subsequent modifications to the proposed action, if a species or critical habitat that occurs in the area covered by your program is subsequently listed, or if new information reveals impacts of the identified activity that may affect listed species. In addition, consultation must be reinitiated before development and production activities occur in the Bering Sea Region.

We look forward to continued cooperation during future consultations.

Sincerely yours,

William G. Cordon
Assistant Administrator
for Fisheries

Enclosure

Endangered Species Act

Section 7 Consultation - Biological Opinion

Agencies: Bureau of Land Management and U.S. Ceological Survey

Activities Considered During Consultation: Outer continental shelf oil and gas leasing and exploration in the Bering Sea Region encompassed by proposed lease sales in Norton Basin (57, 88, 99), St. Ceorge Basin (70, 89, 101), Northern Aleutian Shelf (75, 92), and Navarin Basin (83, 107).

Consultation Conducted By: National Marine Fisheries Service (NMFS), Alaska Region

Background

On June 6, 1980, the Bureau of Land Management (BLM) and the U.S. Geological Survey (USCS) requested formal joint regional consultation pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) on four proposed outer continental shelf (OCS) oil and gas leaae sale areas in the Bering Sea Region (i.e., Norton Sound, St. Ceorge Basin, Northern Aleutian Shelf, and Navarin Basin) with regard to potential impacts of the Department of the Interior's (DOI) OCS oil and gas program on endangered and threatened speciea. As a result of that request, representatives of BLM, USCS, and NMFS met in Anchorage, Alaska on June 25, 1980, to discuss endangered species that might be affected by the proposed regional OCS oil and gas activities.

The NMFS agreed to conduct an "aggregate" consultation for OCS oil and gas leasing and exploration in the Bering Sea Region encompassed by the proposed lease sales in Norton Basin, St. Ceorge Basin, Northern Aleutian Shelf, and Navarin Basin. An "aggregate" consultation, as described in

50 CFR Section 402.04(a)(3), 43 FR 871, is an efficient approach to comply with consultation requirements of Section 7(a)(2) of the ESA, in that the BLM and USCS will be aware of additional information needs and potential problems at an early phase in the oil and gas leasing program in the Bering Sea. This is NMFS's Biological Opinion for OCS gas and oil leasing program in the Bering Sea Region.

Although NMFS considered the entire range of OCS activities in the consultation procesa, this Biological Opinion addresses only the leasing and exploration phases of OCS activities in the Bering Sea Region. Activities covered by this opinion include pre-lease exploration (geophysical surveys and Continental Offshore Stratigraphic Teat Wells (COST Wells)), the lease sale, and post-lease exploration (geophysical surveys, construction, exploratory drilling, and associated support activities). BLM-sponsored research on the distribution and abundance of endangered whales, and on the effects of oil and other OCS activities has not been completed. When available, NMFS will review the results of the completed studies and plans for future exploration. DOI indicated that consultation will be reinitiated for each lease sale in the Bering Sea Region. In addition, DOI must review exploration plans and activities to determine whether consultations on those individual activities must be reinitiated. When the development and production phases are reached and as information on the specific impacts of the activities, including the cumulative impacts of the program becomes available, formal consultation must be reinitiated.

Consultation was conducted for the eight endangered species of whales listed below. No other listed species for which NMFS is responsible occur in the Bering Sea. There are no species proposed for listing or any designated or proposed critical habitat in the Bering Sea Region.

Common Name	Scientific Name
Right Whale	Balaena glacialis
Bowhead Whale	Balaena mysticetus
Gray Whale	Eschrichtius robustus
Fin Whale	Balaenoptera physalus
Sei Whale	Balaenoptera borealis
Blue Whale	Balaenoptera musculus
Humpback Whale	Megaptera novaeangliae
Sperm Whale	Physeter macrocephalus (= P. catadon)

Appendix I gives information about the population size, status, and occurrence of each of the endangered whales in the various lease areas.

This hiological opinion discusses the distribution of endangered whales in the Bering Sea Region under consideration for OCS oil and gas leasing, the type and scope of the proposed exploratory activities, the possible impacts of pre- and post-sale exploration activities on endangered whales, and the research required to gather additional data and information. This opinion addresses the question of whether lease sales and exploration activities in the Bering Sea are likely to jeopardize the continued existence of endangered species of whales.

Proposed Lease Areas As Whsle Habitats

The four proposed lease areas of the Bering Sea are important to the normal activities and movements of endangered whales. The lease areas encompass whale habitats that are vital to the survival of certain of these species. Individually, and collectively, OCS activities in these lease areas have the potential to harm populations of endangered whales.

Norton Basin:

Bowhead and gray whales frequent the area north of St. Lawrence Island and west of Sledge Island in the outer Norton Basin area (west of 166°W longitude). This area is vital to the spring and fall migrations of the bowhead and is a major feeding area for the gray whale. The lagoons and

nearshore coastal areas around St. Lawrence Island, especially near the western, southern, and eastern ends, are important feeding grounds for gray whales in the summer and fall. Chirikof Basin, north of St. Lawrence Island, is an extremely important feeding area for many gray whales during the summer and early autumn.

The Bering Strait is an important migratory corridor for bowhead, gray and some humpback and fin whales traveling to and from summer feeding grounds in the Chukchi and Beaufort Seas. Bowhead whsles follow open leads in the pack ice to move north through the Bering Strait in April-May, and return south through the Bering Strait ahead of the pack ice in November-December. Gray and humpback whales travel through the Bering Strait from June to October when the pack ice is absent or sparse.

Fin, humpback, and perhaps sei whales seasonally occur in or adjacent to the outer Norton Basin area. Although right whales formerly fed in this area during summer, neither they nor blue nor sperm whales are known to occur there now. Inner Norton Sound is only occasionally occupied by any of these whales.

Navarin Basin:

The entire western Arctic population of bowhead whales may overwinter in the broken pack ice of the central Bering Sea, mainly south and west of St. Lawrence Island as far south as the ice front edge, and perhaps farther south into open water. Although the exact location of overwintering probably varies with the type and extent of the seasonal ice edge, the shelf portions of the Navsrin Basin must be considered an important bowhead whale overwintering area.

The outer shelf edge of the Navarin Basin area also may be seasonally important as a summer feeding area for the fin whale, and possibly the humpback whale. Its importance to the Pacific right whale is unknown. The other whale species probably are only occasional visitors to this area.

St. George Basin:

The St. George Basin area is inhabited by gray whales from spring through fall. During the summer, a few dozen gray whales feed in shallow waters off the Pribilof Islands. A large segment of the grsy whale population probably migrates southward directly through the northeast portion of the Basin from mid-October to late December.

Unimak Pass, southeast of the St. George Basin area, is an important migratory corridor for the entire eastern Pacific population of gray whales. Gray whale movements north through Unimak Pass peak in April and May, and the southward return through the Pass, peaks in November and December. The Pass is used by other species of whales as well.

Fin and humpback whales occur seasonally in the St. George Basin in the late spring and summer. Fin whales appear to concentrate over the continental slope and shelf edge. Humpback whales are found throughout the lease area; most sightings are near the Aleutian and Pribilof Islands.

A few individuals of the other whale species also may be found occasionally in this area, mostly in the summer and fall. A few bowhead whales have also been observed in the northwest portion of the lease area, all in early spring.

Northern Aleutian Shelf:

Almost the entire population of the gray whale passes near the North Aleutian Shelf area during migration northward in April-June and southward in late October through December. The east shore of Unimak Pass is the focal point of the migratory corridor. After entering the area through Unimak Pass, most gray whales migrate close to shore (within 3 km) and follow the perimeter of Bristol Bay to Nunivak Island. Grsy whales feed in the shallow coastal areas along the north side of the Alaska Peninsula and Bristol Bay during their spring migration. In the fall, most gray whales pass within 1 km of the

west and south shores of Unimak Island as they leave the Bering Sea. Some fin whales summer along the shelf-edge, and small numbers of humpback, blue, sei, and right whales may occur in the spring-fall period in this area. Bowhead and sperm whales are not known to occur in this area.

Description Of Proposed Activities

A. Pre-lease Exploration And The Lease Sale

Prior to a lease sale, geophysical seismic information is gathered by geophysical companies. In the Bering Sea this typically is done by vessel surveys during the open water season. A considerable amount of high resolution, acoustic geophysical exploration already has been conducted in potential Bering Sea lease areas under USGS permits since April 15, 1975, and further surveys probably will be conducted in each area. These geophysical operations are carried out with ships up to 100 meters in length. Current geophysical technology entails the use of "air guns" or "sparkers." A limited amount of research (primarily observing responses of bowhead whales to these operations during the summer and fall) on the effects of these systems on cetaceans has recently begun in Arctic waters. Results to date have not been conclusive.

In most lease areas, one or more COST Wells are drilled prior to a lease sale to obtain geological samples of the rock and sedimentary structures of the area. COST Wells are drilled in the manner of any exploration well except that they typically are not drilled at a location where hydrocarbon reservoirs are believed to exist. Results of COST well drilling provides information on whether the sedimentary structures contain source rocks and reservoir rocks suitable for hydrocarbon generation and retention. Impacts associated with COST Wells include industrial noise, vessel and aircraft traffic, drilling muds and cuttings disposal, etc., but do not include an oil spill risk from

the well. On-structure drilling of COST Wells now is allowed but has not been requested by industry for the Alaska OCS. Such an activity would add the risk of an oil spill to the pre-lease activities and would require careful review and additional consultation pursuant to Section 7(a)(2) of the ESA.

Activities involved with OCS lease sales consist of offering the leases, submission of bids, and awarding of leases to the successful bidders.

B. Post-lease Exploration

After leases have been issued, the lessees are authorized, and in some instances required, to perform certain activities. Lessees may undertake certain environmental studies at this stage as part of their preparation of an exploration plan. These may include studies specifically required by lease stipulations and, if needed, studies to provide descriptions of the air quality, oceanographic conditions, and flora and fauna in the leased area that may be disturbed by exploration activities. Geological studies may involve bottom drag sampling or shallow coring. Other studies may employ certain high resolution geophysical instrumentation such as fathometers to determine topography and water depth, and sidescan sonar to map sea bottom irregularities. These studies use accepted sampling techniques that are passive in nature or localized in range.

Exploration plans identify where and how exploratory drilling will occur, and the Environmental Report that accompanies each exploration plan describes the potential impacts of the proposed exploration activities on the marine and coastal environments.

The type of offshore drilling unit used to drill exploratory wells in the Bering Sea will depend upon many factors including environmental conditions and water depth at the site, anticipated duration of the drilling program, type of unit available, time of year, and economic considerations. Depending upon conditions, jack-up rigs, semi-submersibles, or drillships will be

employed as drilling platforms in the Bering Sea, and in some shallow areaa in the Norton Sound area gravel islands may be uaed.

It is not known at this time how many or where exploratory and delineation wells will be drilled (the USGS has projected that 90 wells may be drilled in the four Bering Sea lease areaa). Specific proposala on these matters will be stated for the first time in proposed exploration plana submitted by the individual leasees. The USGS issues drilling permits and will establish criteria under their operating orders to regulate the drilling activities. The U.S. Coast Guard (USCG) is responsible for permitting fixed and mobile drilling platforms and exploratory drilling vessels on the OCS. Construction of gravel islands in U.S. waters will require a permit from the Department of the Army, Corps of Engineera (COE) pursuant to Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act. The National Pollution Discharge Elimination System (NPDES), created by the Clean Water Act and administered by the Environmental Protection Agency (EPA) is applicable to fixed platforms and rigs engaged in OCS oil and gas activitiea. Each of theae agencies has consultation responsibilities under Section 7(a)(2) of the ESA for their involvement in these activities. NMFS will consult with these agencies as required by ESA. Additionally, lease stipulations covering these activities remain to be developed. Such atipulationa should include protective measures for endangered whales. We provide recommendations and reasonable and prudent alternatives herein to help DOI meet its obligations under Section 7 of the ESA. The NMFS will review stipulations for their adequacy in protecting endangered whalea.

C. Exploration Scenarios

Estimates on the proposed exploratory activitiea in the four Bering Sea lease areas have been presented for the proposed five-year schedule.[1] The

[1]DOI. Draft Supplement to the Final Environmental Statement. Proposed Five-year OCS Oil and Gas Lease Sale Schedule. Jan. 1982-Dec. 1986. BLM, 66 pp + six appendices.

following discussion is based on these estimates. It should be recognized that these figures are likely to change as more detailed information is obtained. (The latest proposed schedule, (July 1981) has not yet been approved by Congress as required by law. Currently scheduled sale dates on sales 57 to 83 are taken from the June 1980 schedule.)

Norton Basin, Sales 57, 88, 99:

The first sale (57) is scheduled for November, 1982. Additional sales are planned for October, 1984 (88) and October, 1986 (99). USGS eatimates the oil and gas potential of the Norton Basin area at 0.71 billion barrels (BBbl) of oil and 2.17 trillion cubic feet (TCF) of gas.

Up to five exploratory rigs may work in the area at any given time, and USGS estimates that a total of 20 exploratory and delineation wells would be drilled. Jack-up rigs will be preferred equipment for operations during the open water season in water depths greater than 20 meters. Drillships may be utilized in deeper waters, and gravel islands may be constructed in water less than 8 meters on 35 nearshore tracts just north of the Yukon Delta. Exploration could occur from 1983 to 1995.

Nome probably will be the primary support base. Existing facilities will be used to the extent possible, thereby eliminating or minimizing the need for new onshore construction. If gravel islands are constructed on shallow tracts, activities will be supported in the winter by anchored work barges holding heavy, bulky supplies. Alternatively, gravel islands could be supplied with icebreaker assistance. Air traffic would transit in and out of Nome, and possibly Unalakleet.

St. George Basin, Sales 70, 89, 101:

The first sale (70) is scheduled for December, 1982. Subsequent sales are proposed for December, 1984 (89) and December, 1986 (101). USGS estimates the oil and gas potential of the St. George Basin area at 1.48 BBbl of oil and 4.28 TCF of gas. A maximum of 3 exploratory rigs would work the area at any

given time, drilling a total of 28 exploratory and delineation wells. Preferred rigs are larger semi-submersibles that can operate year-round unless severe ice-buildup occurs in abnormally cold winters. Drillships will be the equipment of second choice. Exploration wells will be drilled between 1984 and 1995.

Dutch Harbor will be the likely primary support base for exploration. Existing facilities would be used to the extent possible. Cold Bay may become a transit exchange base for personnel flying to and from the sale area.

Northern Aleutian Shelf, Sales 75, 92:

The first sale (75) is scheduled for October, 1983. A subsequent sale is proposed for April, 1985 (92). The Northern Aleutian Shelf area is estimated to contain 0.99 BBbl of oil and 2.37 TCF of gas. Hydrocarbon potential is believed to be bighest in the southern portion of the area, near Cold Bay.

No estimates are available for the number of rigs that may operate in thia area, but the number probably would be similar to that anticipated for the Norton and St. George Basin areas. It is estimated that 20 exploration and delineation wells may be drilled, between 1984 and 1996. Shore bases would be the same as used for the St. George lease area, i.e., Dutch Harbor and Cold Bay.

Navarin Basin, Sales 83, 107:

The first sale (83) is scheduled for December, 1984. A subsequent sale is proposed for March, 1985 (107). The Navarin Basin's oil and gas potential is estimated at 1.74 BBbl of oil and 7.14 TCF of gas. The northwest area near the U.S. - Russia 1867 Convention Line is believed to have the greatest potential for hydrocarbons. The number of exploratory rigs that may operate in this area is unstated. Based on the larger oil reserve potential of Navarian Basin compared to other Bering Sea lease areas, a greater number of exploratory rigs may be used. An estimated 30 exploration and delineation wells will be drilled between 1985 and 1998.

Until tracts are selected it is not possible to predict specific areas of impact. St. Paul and/or St. Matthew Island may serve as forward supply bases for operation in this area.

Potential Impacts To Endangered Whales From The Proposed Activities

Potential effects of oil and gas exploration and related human activities on endangered whales include the following:

1. Behaviorsl disturbances caused by noise from geophysical seismic surveys, aircraft and ship traffic, construction activities, and drilling activities. These disturbances could cause slterations of migration pathways with unknown effect, or displscement from feeding or breeding grounds;

2. Physical impacts from the placement of structurea in areas inhabited by the whales;

3. Oil spills which, if they occurred when whales are present, could cause fouling of the feeding mechanism (baleen plates), disruption of respiratory function, ingestion of oil with uncertain effects on whale physiology, the irritation of skin and eyes, or a reduction of food supplies through contamination or alteration of the msrine habitat.

Noise Disturbance:

Noise associated with petroleum exploration can affect whales adversely.[2] High frequency sounds cause permanent ear damage in laboratory animsls and could sffect marine mammals adversely. Low frequency sounds that are likely to result from petroleum exploration are less destructive than high frequency sounds; low frequency effects are difficult to determine. Although adverse physical effects from low frequency sounds on cetaceans are unknown, noise does have nonauditory stress effects on birds and mammals. These include physiological stress involving hormonal responses leading to lowered

[2]Geraci, J.E. and D.J. St. Aubin, 1980. Offshore petroleum resource development and marine mammals: A review and research recommenations. Mar. Fish. Rev., Nov. 1980, pp 1-12.

resistsnce and increased vulnerability to environmental disturbances, snd endocrine imbalances that may affect reproduction adversely. The extent to which cetaceans may be susceptible to such stress-mediated effects is unknown.

Cetaceans rely on their well-developed auditory sense for communication and/or echo-location. Background noise from oil and gas activities in the marine environment could interfere with these functions and result in social disruption and echo-confusion.

Noise from boat and air traffic snd from drilling activities could affect cetaceans moving through or feeding in OCS oil and gas exploration areas. Gray and humpback whales co-exist with human activities in certain areas, which suggests that some cetaceans can sdjust to some levels of noise from boat and air traffic. Above some threshold, increases in ambient noise may have harmful effects. Barge traffic has been observed to disturb beluga whales in the Canadian Beaufort Sea, snd Scammon Lagoon in Mexico has been closed to all but local fishing boats because of disturbance to gray whales there. Humpback whales, killer whales and Dall porpoises may have been affected adversely by boat traffic in Glacier Bay, Alaska. The National Park Service has published regulations governing the number of tour ships that may enter Glacier Bay and the speeds and distances that all vessels must observe in the presence of humpback whales. NMFS has published similar guidelines for the humpback whale grounds in Hawaiian waters.

Noise resulting from the construction of gravel islands in the Norton Basin probably would not affect whale behavior and migration aince the islands probably would be placed in the shallow southeastern areas of inner Norton Sound where endangered whales usually do not occur. Studies being conducted in the Canadian Beaufort Sea on bowhead whales soon may provide additional information on the effects of noise produced by this activity. To avoid potential impacts construction of gravel islands should not occur when and where whalea are present. The NMFS will make recommendations concerning the

timing of gravel island construction as appropriste after reviewing USGS exploration plans.

More definitive studies are needed to predict more accurately the nature and extent of impacts to endangered whales from the noise produced by OCS activities on the migration, reproduction, or calving of whales, particularly the bowhead and gray whale. Regulation of sircraft and vessel traffic can ensure that this source of disturbance is minimized.

Physical Impacts:

Temporary gravel islands for exploration, once in place, are not likely to interfere with whale migration or other behavior. Observations in other geographic aress indicate that whale behavior is not disrupted by fixed platforms and islands.

The mooring chains used to position drill ships probably will not have an adverse impact on endangered whales; these chains will be taut, and it is unlikely that whales will become entangled. Reflectors can be mounted to mooring chaines to make them acoustically visible to whales.

Oil and gas exploration in the Bering Sea will result in an increase in ship and boat activities which will result in an increased risk of collisions between vessels and whales. The NMFS believes that the short-term increase in vessel traffic is unlikely to jeopardize the continued existence of any species of endangered whale. Fishing vessel traffic already is high and the additionsl increase by the petroleum industry operators probably will be minor. Nevertheless, certain areas contain significant numbers of whales, and encounters may be likely. Vessel operators should be advised of such areas and of boat operation procedures that can be used to avoid collisions.

Oil Spills:

Oil spills are not uncommon in OCS operations. The vast msjority of these spills involve less than 50 barrels per incident and result in negligible

measurable or long-term environmental damage. Large oil spills involving 1,000 or more barrels of oil are infrequent. Catastrophic spills such as an uncontrolled blow-out releasing thouaands of barrels of oil into the environment over a period of days or weeks are too rare an event to calculate their probability of occurring with any reliability. Nevertheleas, there is the potential for a blow-out to occur.

According to the National Research Council report on "Safety and Offshore Oil"[3] the rates of blow-outs in the past 10 years is 1 per 264 wells drilled in the U.S. waters. Most of these were gas blow-outs, but one well released 53,000 barrels of oil before being controlled. Four blow-outs required relief wells to be drilled to regain control. Exploratory drilling in new environments possesses unknown risks that may increase the potential of a well blow-out. Seasonal restrictions on drilling in certain areas can be used to preclude the possibility of a catastrophic oil spill during times of the year when endangered whale species are numerous and likely to encounter the spilled oil.

Oil spills have the potential to severly affect endangered whales. The magnitude of the impact would depend on the location, size of the spill, and on other environmental circumstances of the spill, conditions which are impossible to forecast. The risk of an oil spill in locations and times of year when whales are abundant should be avoided.

In the unlikely event of an encounter with a major oil spill, cetsceans could be severely affected. An oil spill could damage baleen whale feeding mechanisms, impair vision, snd disrupt respiratory snd digestive systems.

There is no (availsble) evidence that indicates whether cetaceans are able to detect and avoid hydrocarbon pollution. Accounta from past oil spills indicate that some marine mammals, for example seals and sea lions, sometimes

[3]National Academy Press, 1981. Safety and Offshore Oil. Committee on Assessment of Safety of Outer Continental Shelf Activities. 332 pp.

do not avoid oil; however, no whales, dolphins, or porpoises have been found coated or fouled with oil.[4] Cetacean skin is usually smooth and unlikely to accumulate oil. Those species with major surface irregularities or eroded areas, such as the gray, humpback, and bowhead may retain oil on parts of their bodies. Unlike pinnipeds, whose fur is visibly affected by oil, an oil-fouled cetacean may go unnoticed. Although oil-fouled cetaceans have not been observed, the nature of their skin suggests that they may be particularly vulnerable to noxious effects of surface contact with hydrocarbons. Unlike other mammals, the epidermis of cetaceans is not keratinized, but is composed of living cells that are virtually unshielded from the environment and may be permeable to hydrocarbons. Cetacean epidermis may react to noxious substances, such as oil, in a manner similar to that of sensitive mucous membranes. Physical or chemical disruption by oiling might be expected to have immediate and far-reaching metabolic consequences, perhaps affecting vital ionic regulation and water balance.

Cetacean vulnerability to oil ingestion varies with species, type of oil and nature of the oil spill. Baleen whales such as blue, fin, humpback, and bowhead whales accidentally could engulf large quantities of oil while feeding on plankton concentrations that may be present in an oil spill area. Much of the oil thus engulfed probably would be forced out of the mouth during the feeding process; however, oil coating or fouling of the baleen plates could occur and some oil would be ingested. Studies in progress have demonstrated that oil causes matting of the baleen fringes, which reduces filtering efficiency. Other baleen whales, such as right and sei whales, which skim the water surface and cover relatively large areas while feeding, may be the most vulnerable to baleen fouling and oil ingestion from surface oil pollution. The effect of oil ingestion on whales is unknown.

[4]Geraci, J.E. and D.J. St. Aubin, 1980. Offshore petroleum resource development and marine mammals: A review and research recommendations. Mar. Fish. Rev., No. 1980, pp. 1-12.

The bottom-feeding gray whale is unlikely to ingest surface oil but could be prone to ingestion of hydrocarbons in the bottom sediments of nearshore areas that are contaminated by either acute or chronic oil pollution. Cetaceans, especially the benthic feeders, are reported to have a poorly developed sense of taste, as indicated by the presence of foreign material in their stomachs. This evidence implies that some whales may not be able to differentiate between hydrocarbon-contaminated and uncontaminated food.

Inhalation of oil and/or oil clogging of the cetacean blowhole are unlikely as the typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inhalation and an abrupt closure of the blowhole. This process prevents inhalation of water and, presumably would keep oil from being inhaled. However, the more toxic volatile fractions of oil and hydrocarbon gas could be inhaled. Thus the inhalation of hydrocarbons probably would depend on the quantity and chemical properties of the oil.

The greatest potential indirect impact from oil and gas activities on cetaceans would be the destruction or contamination of critical food sources from acute or chronic oil pollution. Most of the migratory baleen whales (bowhead, fin, gray, and humpback) probably are seasonal feeders and rely on the abundant food sources of northern waters for the bulk of their annual nourishment. They live largely off their stored blubber reserves while migrating and while on their winter ranges.

Euphausiids and copepods are important foods of the bowhead, humpback, fin, blue, sei, and right whales, and benthic amphipods and other invertebrates are important foods of gray whales. The destruction or contamination of these food resources by oil pollution would adversely affect the associated whale species by causing them to migrate to their wintering areas in a lean and probably stressed condition. Inadequate nutrition probably would lead to reduced reproduction success, and increased mortality. Thus it is likely that an oil spill that affected food resources would cause

additional stress to an already endangered or depleted whale population. The right, humpback, blue, and bowhead whales are among the most endangered whale species and are also "restricted feeders," depending on an abundance of only a few species of plankton. These whales probably also have the lowest tolerance to increased stress and mortality.

The significant reduction of plankton populations in the Bering Sea as a whole from oil spills is improbable. However, oil spill in a localized feeding area with highly concentrated food resources could lead to localized and temporary loss or contamination of the food resources, and would contribute to adverse environmental stress on these already depleted whale populations. Of particular concern in the Bering Sea are the benthic food resources in localized gray whale feeding areas in Chirikov Basin, Bering Strait, and near St. Lawrence Island.

The bowhead whale and the gray whale would be the most vulnerable to the direct impacts of an oil spill. The bowhead would be most likely affected by an oil spill in the Bering Strait or Norton Basin near St. Lawrence Island during its spring and late fall migrations through these waters, and in the Navarin Basin during the winter. Gray whales are most vulnerable near Unimak Pass in the spring and fall, and in the Bering Strait, Chirikov Basin, and near St. Lawrence Island during the summer.

Cumulative Impacts:

Cumulative effects of the aforementioned impacts are unpredictable at this time. While cumulative impacts are possible, the degree of severity or time it would take to observe any measurable effects cannot be foreseen. NMFS will monitor OCS activities in the Bering Sea Region and review new information concerning endangered whales for indications of cumulative impacts. Studies funded by BLM also may provide information that will help identify such impacts. Should hydrocarbons be discovered in the Bering Sea, or should hydrocarbon exploration continue in combination with extensive development and

production of hydrocarbons in any adjacent areas of the OCS, demonstrable cumulative impacts could be produced. Careful attention must be given to the overall population status of these species and the quality of their habitat during the development and production periods in any OCS lease areas.

Conclusions

The NMFS believes that there is insufficient information concerning oil and gas exploration activities in the Bering Sea to allow us to determine whether such activities are likely to jeopardize the continued existence of endangered whales found there. We lack important information regarding the specific details of activities that may occur in individual lease areas (such as acoustic geophysical surveys, locations of leases, and exploration plans, etc.). However, we believe that it should be possible for the BLM and USGS to plan activities during the exploration phase in such a way as to avoid the likelihood of jeopardizing the continued existence of any species of endangered whale. Below we offer some reasonable and prudent alternatives that DOI can now adopt to avoid the possibility of jeopardy to these endangered whales. We emphasize here that it is our belief that DOI plans to reinitiate consultation on all future lease sales in the Bering Sea Region. Such consultations can provide DOI with additional measures that can be taken to ensure that specific OCS exploration activities are not likely to jeopardize the continued existence of any species of endangered whale.

Future actions that may affect endangered whales will require additional consultation pursuant to Section 7(a)(2) of the ESA. These actions will be evaluated as they become known, and we will continue to review, on a case by case basis, results of studies and the necessary federal permit applications required for the OCS activities.

We have based our opinion on the following:

A. Pre-Lease Stage

There probably will be no adverse impacts to endangered whales from the environmental or biological studiea conducted in potential lease areas. These activities include trawling, sediment sampling, and bottom-profiling.

Further geophysical seismic exploration is expected in each lease area. At this time, knowledge of future levels of activity is insufficient to predict the magnitude of potential effects on endangered whales of noise from seismic surveys. We are especially concerned that seismic noise may affect the behavior of endangered bowhead and gray whales on their feeding and breeding grounds and along with migratory corridors and could possibly lead to altered distribution patterns and reduced productivity. DOI should review geophysical permit applications to determine if consultation pursuant to Section 7(a)(2) is required. Permit applications should be sent to NMFS' Alaska Office for review and comment.

We assume that COST Wells will be drilled off-structure. Additional consultation under Section 7(a)(2) is required for drilling on-atructure COST Wells.

B. Exploration Stage

The type, and number of exploration platforms in an area can only be estimated at this time. Information on the times and locations of these platforms, of the construction of gravel islands, and of drilling activities are needed to predict the effects of exploration activitiea on endangered whales. Because this information will not be provided until the exploration plans are submitted, all proposed exploration plans and accompanying environmental reports submitted to the DOI must be reviewed to determine if additional Section 7 consultations are required.

The effects of geophysical activities will be the same as discussed for the pre-lease stage.

Endangered Whales Research Needs

Additional biological data also are required before NMFS can render a reliable opinion concerning the likelihood of jeopardy to endangered whales from OCS activities in the Bering Sea. NMFS recognizes BLM's valuable research efforts on endangered whales, particularly the bowhead. We encourage the continuation of this effort. Below we provide DOI with our assessment of the kind and amount of information needed before NMFS can complete a comprehensive Biological Opinion on the question of the likelihood of jeopardy to endangered whales from OCS activities.

The BLM Alaska OCS Office[5] proposes that a key species/key effects approach be employed to obtain information and data sufficient to answer important effects questions. Under that approach, research efforts in the Bering Sea would be directed towards bowheads, gray, fin, and humpback whales. NMFS believes priority consideration should be assigned to research under such a program as given in Table 1. Emphasis should be placed on studying gray and bowhead whales in the Norton Basin, Chirikov Basin, and Bering Strait Regions, humpback, gray, and fin whales in the St. George Basin, gray and humpback whales in the Northern Aleutian Shelf and Unimak Pass, and bowhead whales in overwintering areas in the Navarin Basin. Seasonal distributions, numbers, and habitat uses are needed. Observations on other endangered whale species should be made whenever possible. The BLM should ascertain whether or not the right whale presently occurs in the Bering Sea.

[5]Draft Technical Paper, "Endangered Species Research: A Rationale For The Selection Of A Research Strategy," by C.J. Cowles and J.L. Imm. BLM/OCS. Anchorage, Alaska.

Table 1. Endangered cetaceans, ranked by research need for four Bering Sea OCS lease areas, based on these criteria: total abundance, dependence on habitat, and susceptibility to location and of activity within or adjacent to lease areas.

	Norton Basin		St. George	No. Aleutian	Navarin
Rank	Outer	Inner	Basin	Shelf	Basin
1	Gray	Bowhead	Humpback/Gray	Gray	Bowhead
2	Bowhead	Gray	Fin	Humpback	Fin
3	Fin	-	Sei/Blue/Right	Fin	Humpback
4	Humpback	-	Sperm	Right	Sperm

Major data gaps exist on the effects of oil and associated OCS activities on cetaceans. Studies are needed to determine the effects of various sound frequencies and levels emitted from industry operations on the behavior of the whales. Research should continue to evaluate the impacts resulting from human activity and, to a lesser extent, offshore structures on whale populations. The effects of oil spills on cetaceans are still not understood. Studies currently conducted or funded by BLM have begun to address these problems, and meaningful results should become available within the next few years.

The NMFS believes that the question of cumulative impacts deserves considerably more attention than it has been given to date. We are especially concerned that the bowhead whale is potentially subject to any adverse effecta that may be associated with OCS oil and gas activity throughout its entire Alaska range as well as in its summer habitats in Canadian waters. Risks to this whale from noise and other potential sources of behavioral disturbance, oil spills, and habitat displacement should be assessed from the perspective of its complete habitat range rather than on a lease area by lease area basis. To accomplish this will require substantially better knowledge of the biology and habits of this whale throughout its range and over its entire life cycle. Information on cumulative effects will become particularly critical as the development and production stages are approached in the Bering Sea and Arctic lease areas. In particular, knowledge of recruitment, habitat use patterns

adjacent to proposed lease areas, and knowledge of variations in habitat partitioning among areas by season are needed in order to help determine and predict impacts, if any, to the segment of the population affected.

Reasonable Prudent Alternatives

Despite our inconclusive Biological Opinion the NMFS believes that DOI can presently plan OCS activities to avoid the likelihood of jeopardizing the continued existence of endangered whales in the Bering Sea Region. Here we offer DOI reasonable and prudent alternatives to help DOI meet this goal.

We are unable, at this early stage in the OCS process, to provide detailed alternatives for each of the four Bering Sea lease areas. Additional consultations will be needed as more detailed information is made available on the locations, timing and nature of each proposed lease area activity and on endangered whales in these lease areas. Sale notices, and subsequent exploration plans and permit applications should be reviewed by DOI on a case-by-case basis as activities are proposed to determine if additional Section 7 consultation is needed.

At this time reasonable and prudent alternatives that should be incorporated into the OCS leasing process or included in leases to avoid impacts and to ensure protection of endangered whales during the lease sale exploratory phaae of the oil and gas activities are as follows.

1. Leasing should not take place in the Bering Strait and Chirikov Basin. The Bering Strait is extremely important as a migratory corridor for the entire bowhead whale population (April through May, and November through December), for a substantial part of the gray whale population (May through October). Both the Bering Strait and Chirikov Basin are important feeding habitats which are extensively occupied by gray whales from May through October.

2. Seasonal drilling restrictions should be placed on leases in the following areas. Sufficient time must be included in the seasonal restrictions to allow for drilling of relief wells and oil spill clean-up before the endangered whales re-enter each area.

a. There should be no drilling in the moving pack ice zone of Norton Basin during the winter and spring seasons (November 1 through May 31). This restriction would protect the bowhead whale from the risk of an oil spill in leads and the moving pack ice where it would be impossible to clean-up. Oil from a spill in these areas could be transported with the pack ice to bowhead overwintering areas near St. Lawrence Island, or may be encountered in the lead systems by these whales on their northward spring migration.

b. Exploratory drilling in the Navarian Basin area should be prohibited during the winter and spring months (December 1 through May 31) when pack ice is formed and overwintering bowhead whales are present in the area. Drilling should be limited to the ice-free season (June 1 through November 30).

c. Drilling in the vicinity of Unimak Pass should be prohibited during the spring (April 1 to June 30) and fall months (November 1 to January 31) when the entire gray whale population migrates through these waters.

3. Aircraft and vessel traffic should be controlled to avoid disturbances to endangered whales.

Recommendations

Section 7(a)(1) requires Federal agencies to utilize their authorities in furtherance of the purposes of ESA by carrying out programs for the

conservation of endangered and threatened species. To help DOI meet this obligation with respect to OCS activities in the Bering Sea Region NMFS offers the following recommendations:

1. We recommend that the BLM continue their studies in the distribution, abundance and habitat use of endangered whales in the Bering Sea.

2. We recommend that the BLM continue studies to gather information on the imacts of oil spills on endangered whales as well as on the effects of noise on these species.

3. Since the occurrence and distribution of cetaceans in the Bering Sea is not well known, NMFS desires to expand the existing data base. We believe that exploratory activities furnish an excellent opportunity for obtaining data on endangered whales, and therefore request that all sightings during exploration activities be reported to NMFS Alaska Regional Office. NMFS will furnish identification guides.

4. We recommend that the BLM and USGS establish for the Bering Sea Region a Biological Task Force, of which NMFS will be a member, to assist the DOI in OCS-related decisions that may affect endangered species and other biological resources of this Region.

5. Lessees should be notified, through information contained in the Notice of Sale and the lease, of guidelines that operators should use to avoid any potential problems of harassment or physical harm to these cetaceans. Appendix 11 provides guidelines to vessel and aircraft operators to avoid harassing endangered whales.

Opportunities for Additional Consultation

DOI has indicated that consultation will be reinitiated for individual lease sales to be held in the Bering Sea Region. During the post-lease exploration phase, the DOI has agreed to provide NMFS with all exploration

plans, and any subsequent revisions of such plans. DOI should review these plans to determine if further Section 7 consultation is necessary.

Consultation under Section 7 will be reinitiated upon commencement of the development and production phase in any of the Bering Sea lease areas. At such time, any additional information available on the potential impacts of endangered whales will be re-evaluated, details on the location and magnitude of OCS development will be gathered, and a new Biological Opinion will be issued.

Consultation also must be reinitiated if: new information reveals impacts of the proposed activities that may affect listed species; the identified activities are modified in a manner not considered herein; or a new species is listed or critical habitat is designated that may be affected by the proposed activities.

This biological opinion in no way permits the taking of any endangered or threatened species. Taking of such species is prohibited under Section 9 of ESA and is subject to prosecution unless permitted pursuant to Section 10(a) of ESA or by regulation.

Appendix 1

Endangered Whales Occurring in the Bering Sea

Eight species of endangered cetaceans may occur in the four proposed lease areas in the Bering Sea. These are the bowhead, gray, fin, humpback, blue, sei, right, and sperm whales. Information relating to population size, status, and occurrence of each species in the various lease areas is summarized in Table A.

Bowhead Whale:

The bowhead whale (Balaena mysticetus) is one of the rarest and one of the least known of the great whales. These ice-associated whales inhabit Arctic waters during the summer and Bering Sea waters in the winter. Bowhead whales pass through the Bering Strait and enter the Bering Sea in late fall, in advance of the winter extension of the arctic pack ice. From about November to April or May, the entire population of bowhead whales, estimated at about 2,300 individuals, may occupy the broken pack ice of the central Bering Sea. The exact location of the wintering area is poorly documented, but appears to extend from south and west of St. Lawrence Island to as far as the ice front edge, and perhaps occasionally farther south into open water. Their over-wintering range probably varies with the type and extent along the 100 to 200 m depth contour at the continental shelf edge. During 1979

TABLE A. Eastern North Pacific endangered whales occurring in or adjacent to OCS lease areas in the Bering Sea. Codes are: I - Important seasonally; O - Occasional, not normal habitat; R - Rare; N - Not present; Blank - no data. From Howard Braham, personal communication.

Species	Popu-1/ lation Size	Status	LEASE AREAS					
			St. George Basin (70)	No. Aleutian Shelf (75)	Navarin Basin (83)	Norton Sound 4/ Outer		(57) 5/ Inner
Bowhead	2,300	Stable or decreasing slightly	R	N	I	I		I
Gray	15,000+	Stable or increasing slightly	I	I	O	I		O
Fin	17,000	?	I	I	I?	O		O
Humpback	1,200	?	I	O	O	O		N
Blue	1,700	?	O	O?	R	N?		N?
Sei	9,000	?	O	O	O	R		N?
Right	200	?	I	O?	O?	N2/		N
Sperm	200,000	?	O	N	O3/	N		N

1/ Eastern North Pacific population sizes, Bering Sea components may be considered small for all but bowhead and gray whales.

2/ Formerly occurred in Norton Sound area.

3/ Edge of continental shelf, and in deeper water.

4/ West of 166°W longitude.

5/ East of 166°W longitude.

the waters of the major feeding areas are relatively shallow (20-60m). Some animals continue north through the Bering Strait into the Chukchi and shallow Arctic Seas. A small portion of the gray whale population summers in the southern Bering Sea, particularly near the Pribilof Islands.

The population of gray whales appears to be slightly increasing.

Fin Whale: The fin whale, Balaenoptera physalus, summers in the Bering Sea, occasionally as far north as the Chukchi Sea, and migrates to more southern latitudes in winter to mate and calve. The North Pacific population is currently numbered at 17,000 but it is unknown how many of these animals seasonally inhabit the Bering Sea. The growth trend of the population is unknown. Fin whales entering the Bering Sea are apparently composed of two groups; one of mainly mature whales and females without calves which follows the outer shelf edge to as far west as Cape Navarin; and a group of mainly nursing females and immatures which stays in the aouthern Bering Sea Region north of Unimak Pass. They are present during the summer in low numbers in outer Norton Basin and around St. Lawrence Island.

Humpback Whale:

The humpback whale, Megaptera novaeanglise, has a distribution similar to the fin whale. In the summer a portion of the population enters the Bering and Chukchi Seas, where these whales may spend up to 5-1/2 months on their feeding grounds. Their preaent North Pacific population is estimated at only 1,200 animals, and the condition of this population is uncertain. They often occur during summer and fall in the St. George lease area and adjacent waters, and may occasionally be encountered in other parts of the Bering Sea.

Blue Whale:

The blue whale, Balaenoptera musculus, probably rarely enters the Bering Sea; the few that do have been reported as far north as the Bering Strait. Most records for the Bering Sea are from off the continental shelf south of the Pribilof Islands.

Sei Whale:

The sei whale, Balaenoptera borealis, sometimes enters the southern Bering Sea, but are rarely encountered and little is known of their distribution in these waters. They have been reported from southwest of St. Lawrence Island and along the continental shelf edge. They are rare or absent from the northern Bering Sea Region.

Right Whale:

The right whale, Baleana glacialis, is nearly extinct in the North Pacific from over-exploitation by commercial whaling. The population may be below the critical number from which recovery can be expected. Only 200 animals are estimated to remain in the North Pacific. Sightings are exceedingly rare and little is known about the present distribution. St. Lawrence Island may be the northern limit of this species. Most Bering Sea aightings have been in July between the Pribilof Islands and the Aleutian Archipelago, mainly of single individuals.

Sperm Whale:

Sperm whales, Phyaeter macrocephalus, migrate to northern latitudes in the summer. Generally only males reach Alaska waters, the females and immatures are generally found farther south between 40° and 50°N latitude, but may enter

ice-breaker surveys, bowhead whales were seen in the vicinity of St. Matthew Island among broken ice up to 8/10 coverage aa well as in polynyas south and west of St. Lawrence Island.

In apring the whales move through the broken ice and amall open leads around St. Lawrence Island, travel northward through the outer Norton Sound area and pass through the Bering Strait on their migration to aummering areas in the Arctic.

The nature of winter activities of bowhead whales in the Bering Sea is generally unknown. Mating and calving are believed to occur in the apring and may occur in the central and northern Bering Sea, as well as in the Chukchi and Beaufort Sea, during or prior to the commencement of the spring migration. The growth trend of the population is uncertain.

Gray Whale:

The gray whale, Eschrichtius robustus, has an eastern Pacific population that migrates from its wintering areas of Mexico to aummer in the Bering and Chukchi and occasionally the Beaufort Seaa. The spring migration of these whales through Alaska waters and into the Bering Sea follows the coastline close to shore. Whales first appear in the Gulf of Alaska from June to July. Inside the Bering Sea, the gray whales follow the Bristol Bay coast to the vicinity of Nunivak Island. From Nunivak Island they move offshore to their northern feeding areas.

Virtually the entire population of 15,000+ animals summer in the Bering and Chukchi Seas. Large concentrations of gray whales (5000+) occur from north of St. Lswrence Island to the Bering Strait from May to November where

the Bering Sea during warm years. Male sperm whales are relatively abundant in the central Bering Sea to as far as 62°N latitude and are known to occur there from April to September. The main area of concentration appears to be along the continental slope between the Pribilof Islands and Cape Navarin, especially in the vicinity of 180°W longitude.

Appendix II

The Endangered Speciea Act prohibita harassment of endangered and threatened apecies whether the harassment occurs through an intentional or negligent act or omission. Harassment refers to conduct or activities that disrupt an animal'a normal behavior or cause a significant change in the activity of the affected animal. In many cases the effect of harassment is readily detectible: a whale may rapidly dive or flee from an intruder to avoid the source of disturbance. Other instances of harassment may be leas noticeable to an observer but will still have a aignificant effect on endangered whales.

Leaseholders must be prepared to take all reaaonable and necessary meaaures to avoid harassing or unneceasarily disturbing endangered whales. In this regard, leaseholders should be particularly alert to the effects of boat and airplane or helicopter traffic on whales.

In order to insure that leaaeholders may derive maximum benefits from their operations at a minimum cost to the health and well being of endangered whalea, the following guidelines are offered to help avoid potential harassment of endangered whales.

(1)(a) Vessels and aircraft should avoid concentrationa or groups of whalea. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than

1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.

(b) When weather conditions do not allow a 1,000 foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000 foot altitude atipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.

(2) When a vessel is operated near a concentration of whales the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.

(3) Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellors [or screws] are engaged.

(4) Small boats should not be operated at such a speed as to make collisions with whalea likely. When weather conditions require,

auch as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.

When any leaseholder becomes aware of the potentially harassing effects of leaae operations on endangered whalea, or when any leaseholder is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further haraasment should be taken until the National Marine Fisheries Service is consulted for instructions or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for avoidance of disturbance and harassment of endangered whales.

Leaseholders are advised that harassment of endangered whales may be reported to the National Marine Fisheries Service for further action, including prosecution, under the Endangered Species Act of 1973.

APPENDIX H

SCOPING PROCESS FOR PROPOSED LEASE SALE 57

Prepared by
The Alaska OCS Office

The following is a summary of the concerns raised through the Norton Sound scoping process. The purpose of these meetings was to determine major issues of concern, possible mitigating measures, and alternatives to the proposal.

Scoping meetings were preceded by a presentation and slide show describing socioeconomic and environmental studies completed or underway for the proposed lease area, the leasing process with critical dates for the proposed sale, and a discussion of available oil and gas technology, as well as oilspill cleanup methods. Representatives of Geological Survey also participated. A workshop followed the OCS/GS presentation during which time the following information from each meeting was recorded.

1. Initial scoping meetings in Nome, Unalakleet, and Golovin.

   a. Meeting with the King Islanders, King Island Hall, Nome, Alaska, March 10. Issues of concern include:

      Seals (Ring and Bearded): Migration starts in April. Pupping for ring seals generally begins in April; bearded seals follow by 1 - 2 weeks. Subsistence hunting begins in April until approximately June.

      Walrus: Pupping occurs in May. Walrus hunting occurs at approximately the same time as the seals--May through mid-July. Area bunted by the King Islanders extends from Nome to Cape Wooley and King Island.

      Birds: The use of birds and their eggs for subsistence. Species include eiders, cormorants, murre and ptarmigan (in the winter). Spring migrations generally occur in late April or early May. Fall migrations occur in September.

      Fish (Wintertime):

      Crab. Use begins when shorefast ice is safely anchored. Season is approximately January to mid-May.

      Tomcod and blue cod. Approximately the same as the crab.

      Whitefish. Use begins in September (upstream).

      Trout. Use is generally upstream by ice fishing during October - November.

      Fish (Summertime):

      Salmon. Use extends from approximately July 1 through mid-August (as specified by ADF&G regulations).

      Ice:

      The pressure of ice against a structure.

      Cleanup of oil in moving ice.

      Possible burning of oil under ice.

      Oil in the "seal igloo" (a natural shelter used by seals under ice).

      Oil seeping under the ice through the seals' breathing holes.

      Ice ridges.

      The swift movement of broken ice.

      Noise Disturbance:

      Sea mammals, especially walrus, are very sensitive; also the seals.

      Concerned that drilling noise could change migration patterns, causing them to travel longer distances to hunt for subsistence.

      Concern about the effect on fish.

      Additional Concerns:

      Local hire by oil companies.

      Increasing prices adversely affecting the local economy.

      Adverse impacts on local communities, i.e., rising crime rates, sport and recreation hunting vs. subsistence activities, loss of local control.

      Available oilspill cleanup technology.

      Suggested mitigating measures that should be considered include restrictions on year-round drilling activities. Although deeply concerned about an oilspill during the open water season that would adversely affect subsistence activities, the concern is even greater regarding the effects of ice on oil and gas operations. They feel that any exploratory activities should be conducted during the ice-free period, generally mid-May to November.

   b. Meeting for the general public, Nome Elementary School, March 10. Issues of concern include:

      Maintenance of lifestyle.

      Local hire.

      Local economy with regard to inflation.

      Long term lifestyle and economic effects. (What happens after the boom?)

      The impact of an oilspill on subsistence species.

      Ice scouring.

      The effect of an oilspill if there is a late breakup. (Fish such as tomcod will not be upstream, but will be found at the mouths of rivers and streams.)

      Suggested mitigating measure: Bury pipelines below the scour line.

      Two alternatives to the proposal were suggested:

      (1) Delay the sale and explore onshore first.

      (2) The northern block deletion. (Refer to Figure II.B.4.a.-1 in Section II of the environmental statement.)

   c. Meeting with the Mayor and City Council, Nome, March 11. Issues of concern for the municipal government of Nome include:

      Increased population.

      Cost of services to support an increasing population.

      Increased tax base.

      Transportation of hydrocarbons as well as the day-to-day activities of the oil and gas industry.

      Additional concerns include:

      Protection of the food source and habitat for crab, herring, and marine mammals.

      Protection of salmon.

      Possible changes in migration patterns.

      Effects of ice on oil and gas structures.

   d. Scoping meeting with representatives from Kawerak, Inc., Nome Eskimo Community, Sitnasuak Native Corporation, residents of Nome, and village representatives from Shishmaref, Wales, Brevig Mission, Teller, Savoonga, and Gambell. (The village of Little Diomede was unable to send a representative.) The meeting was held in King Island Hall, Nome, on March 11. Issues of concern include:

      Whales and walrus: Concern expressed regarding the migration patterns of belugas. They follow along the southern coast of the Sound, moving east and then north to the Norton Bay area. The walrus herd follows the ice floes and also moves along the southern coast to the Norton Bay area.

      Commercial fisheries: Concern expressed about the possible disturbance of migration patterns. Commercial crabbing occurs within the proposed sale area. There are four salmon fishing co-ops located in the Norton Sound area. There is also a herring fishery. They believe there is a possible wintering area for herring in the proposed lease area. There is a potential for bottomfishing development.

      Birds: Concern expressed for birds that use the ice leads prior to moving to rookeries. Estimate the feeding areas extend out from rookeries approximately 40 miles.

      Seals: Feeding areas are within the proposed sale area.

      Disturbance: Suggested no disturbance of wildlife due to aircraft and boat traffic related to oil and gas activities. They are also concerned that operating noises will disturb fish, sea mammals and waterfowl, particularly the feeding patterns for fish, seals, and belugas.

      Economy: Increasing prices, especially the price of fuel to local communities. The boom-and-bust syndrome.

      Increasing crime rates.

      Possible loss of subsistence privileges under the Marine Mammal Act.

      Local hire: Bringing in outsiders, instead of hiring locally qualified. The possibility of hiring union members only. Native corporations should benefit.

      Loss of transportation.

      Loss of subsistence resulting from an oilspill.

      Maintenance of lifestyle.

      Concern regarding sources of gravel for the development phase.

      Enforcement of regulations. Agency responsibilities relative to oil and gas activities should be clearly understood and spelled out.

      With respect to the possibility of a seasonal drilling stipulation, there was concern expressed that the estimated ice-free date for the Norton Sound area of mid-May was too early.

      A letter from William M. Dann, Executive Director of the Norton Sound Health Corporation, was presented and read at the scoping meeting. Joseph Noongwook of Savoonga also presented a written statement which was read at the scoping meeting.

   e. Meeting with residents of Unalakleet and representatives of Koyuk and Shaktoolik. The meeting was held in the Multi-Purpose Room of the BIA School in Unalakleet on March 12. Issues of concern include:

      Subsistence and maintenance of lifestyle.

      Subsistence use of birds (and eggs) includes all waterfowl and sandhill cranes.

      There is concern regarding the loss of subsistence that could result from an oilspill.

The subsistence use of seals occurs year-round in the Sound.

Local hire or compensation for local people.

There is concern for the increasing price of fuel (oil and electricity) as well as food in local communities. To offset inflation, villagers are increasing their use of dog sleds, which creates additional need for food to feed the teams. There are two types of energy--oil and protein.

Native corporations should benefit from the lease sale.

Concern expressed about the movement of ice and ice scouring.

Concern that studies should be done with local people and with integrity.

Storms were also listed as a concern for the area.

Suggested mitigating measures: An orientation program for oil workers.

Two alternatives to the proposal were suggested:

(1) Delay the sale until after resolution of the Beaufort Sea issue and there is adequate technology.

(2) The eastern block deletion. (Refer to Figure lI.B.5.a.-1 in Section II of this document.)

f. Meeting with residents of Golovin and representatives of the village of White Mountain. The meeting was held in the Golovin Community Building on March 13. Issues of concern include:

Renewable resources (salmon, a source of food and income) vs. the non-renewable resources of oil and gas. Resources that provide income for the local people should not be endangered by any oil and gas activities.

The people are dependent on fish for subsistence, especially the elderly. Fish co-ops will need to be compensated as well as the individual fishermen if there is a loss.

Oilspills will affect the lifestyle. Is there compensation for lost subsistence?

There is concern about the recovery rates for subsistence species as a result of spills.

They want some type of ongoing activity that could bring in money year-round, such as a deepwater port. A part of the area selected by the village includes suitable lands for a supply base. Their considerations thus far have been only in terms of possible onshore mineral development from the Seward Peninsula. They feel they must weigh whether they want immediate jobs "with nothing to follow," or try to protect the renewable resources which support fishing, subsis-

tence, and lifestyle. A port facility would not be as great an impact on the local fishing effort as the main impact from an oilspill.

Secondary activities such as supply boats could be very detrimental.

The people of Golovin are probably not qualified for the better jobs such as technicians. Have training programs for local hire been established by the oil companies?

It is believed that herring winter in the proposed lease area.

Migration patterns through the Sound exist for seal, fish, walrus, and beluga.

Use of renewable resources is from breakup until the middle of summer. It is not continuous, but the biggest concentration is in the early part of the summer.

"We live out here to be closer to nature, and to maintain that lifestyle as long as possible," (Martin Olsen, resident of Golovin and Chairman of the Board, Bering Straits Regional Corporation).

A suggested mitigating measure to be considered for the Norton Sound area would be a test structure. Concern expressed with respect to the movement and pressure of ice.

The discussion on alternatives to the proposal resulted in the endorsement of both the northern and southern block deletions. (Refer to Figures II.B.4.a.-1 and lI.B.6.a.-1 in Section II of this document.)

2. Attendance at the Special AVCP (Association of Village Council Presidents) Convention in Alakanuk, March 25-27.

Members of the Alaska OCS Office and Geological Survey attended the special convention and participated in workshops at the invitation of the AVCP. Issues of concern include:

Oilspills: Concern that there is no assurance the marine mammals and fish will be protected in case of an oilspill. "How will BLM/OCS respond to an oilspill to protect the Native people who depend upon the fish and marine mammals?" They need fuel to heat their homes, to use their snowmobiles and boats, but their first priority is protection of subsistence. Is there compensation for loss of subsistence due to an oilspill? There is no way to prevent subsistence damage and no compensation. Oilspills would affect fish and their spawning areas. An oilspill from a platform at the moutb of a river would create greater problems.

Cleanup: Who has responsibility for reporting a spill? Who is responsible for cleanup? What would be the response time?

Storms in the Norton Sound area can be very destructive.

Village economy and unemployment: Concern about the boom-and-bust syndrome. "After the oil and gas are gone, the Eskimo will remain." Concern that there will be no jobs for the local people. Men and equipment will all be brought in to predominantly Native areas. "Where are the jobs for us?"

Ice--especially the moving ice of Norton Sound--is a serious problem. The ice of the Sound is not like that of Cook Inlet. Ice generally occurs from October to May. Concern about cleaning up oil in the ice if there is an oilspill. What would be the effect on animals if oil carried by ice floes?

It is necessary that proper planning take place if the oil companies need onshore sites for development.

A suggested mitigating measure for the Norton Sound was an orientation program for oil company workers.

The discussion on alternatives to the proposal resulted in the following:

(1) Delay the sale until 1987 to gather information, plan, and prepare.

(2) The southern block deletion. (Refer to Figure II.B.6.a.-1 in Section lI of this document.)

3. Attendance at the Elders' Conference in Nome and the scoping meeting held in Stebbins.

a. Attendance at the Elders' Meeting in Nome on April 3. Invitation to OCS by Kawerak, Inc. Issues of concern include:

The sea is our way of life. Norton Sound is our store.

Ice:

The Sound is covered 7 or 8 months of the year with ice. Exploration is dangerous in an ice-covered area.

The ice in the center of the Sound is like land--3 to 4 feet thick with snow. Stays solid until springtime when it begins to move back and forth. Current becomes strong, moving the ice and breaking it away. Ice moves northward toward the Bering Strait.

There is nothing that can stop the ice when it starts to move; it is very destructive. Ice ridges can form as high as a single-story building. There is concern regarding the force of ice against a rig.

The ice is unpredictable.

Lifestyle and Subsistence:

Concern that drilling will endanger the marine mammals, ducks, and fish that have been and are used for subsistence. They could suffer, and so would the people who depend on them.

Salmon migration is a short season and provides the only source of income that the people derive from the area.

Birds and ducks rest on the water. They cannot survive oilspills.

Concern that the whales, walrus, seals, crabs, and clams be protected.

Concern that outside interference could drive away the animals needed for subsistence.

Kelp is necessary for the herring eggs.

Displacement of animals due to the smell of oil, noise, and oilspills could occur, making it difficult for those who depend on them.

Norton Bay:

The bay is a very important calving area for marine mammals.

Disturbance in or near Norton Bay could cause the beluga whales to move to another area, and would leave the people without an important food source.

Economic Concerns:

The local economy is not that great; dependence is on subsistence to survive.

Oil is produced from the land. The price of oil to the villages is still rising, however.

If the oil companies move in, they will get rich and the local people will suffer.

Pollution:

Seals and marine mammals will stay only on or near clean ice. They will stay away from the ice if there is oil.

The slightest contamination of migratory paths will drive the fish and game away.

Additional Comments

Strong winds and storms occur in the area during the winter.

Historical sites from Rocky Point toward Bluff are important. Have been selected as sites for protection.

Concern expressed that future generations will be affected by oil and gas development.

Support for alternatives to the proposal include the following:

(1) Endorsement of all tract deletions proposed to protect the fish.

(2) Support for the northern deletion to avoid disturbance of seals which are hunted along the coast.

(3) Support for the eastern deletion based on the importance of migratory fish (salmon) and beluga whales.

(4) Development should be 45 miles from the nearest point of Stuart Island and Golovin.

(5) Explore on land first; leave the oceans until later.

(6) Delay exploration until technology is developed that will allow for safe drilling without endangering the people's lifestyle.

b. Scoping meeting held in Stebbins on April 4. Issues of concern include:

The Beaufort Sea area and the Norton Sound area should not be compared; they are not similar.

The proposed lease sale area provides feeding grounds for subsistence species. Oilspills will kill off subsistence. Witb the natural forces of ice moving against an oil and gas structure, eventually there will be a spill. Spills will cause a change in lifestyle and diet.

The entire leasing area is tbe migration path of tbe walrus and the seals. They hunt walrus coming from Diomede and St. Lawrence Islands.

Walrus and seals use tbe ice and move witb the currents. Seals in the Norton Sound include spotted, bearded and barbor.

Spotted seal follow the migration of the herring and tomcod. The spotted seal are hunted in the spring and fall.

The west side of Stuart Island is thick with mussels and of kelp. Herring come into the deep water, then move into tbe sballows to lay eggs.

Belugas feed on herring. They stay in the deep water, but come to the shallow areas for feeding. Tbe people hunt belugas in spring, summer, and fall (tbe latest being November). In addition, they use the tomcod all year round.

Cormorants, eiders, and puffins are found on Egg and Stuart Islands. Other birds in tbe area include murres, whistling and trumpeter

swans, Canada geese, cranes, snow geese, emperor geese, and other waterfowl. From May to September/October, sea gulls, Arctic terns, and loons are found in the area.

Terrestrial animals for this area include brown and black bears, foxes (Arctic, red, and cross), wolves, muskrat, mink, wolverines, lynx, reindeer, and moose. Smaller animals include jack rabbits, snowshoe hare, beaver, squirrels (in the St. Michael area), porcupine, and mice. Land otters may also be using the coastal area to scavenge. Their concern is tbat many of these animals use the coastal areas, and are used in turn by tbe people. It is believed that the impacts of an oilspill reaching the coastal area could be severe.

4. The following scoping meetings were held in Anchorage, Alaska.

a. Alaska Regional Technical Working Group Committee, Intergovernmental Planning Program (IPP), held April 2, 1980. Issues of concern include:

Adequate drilling tecbnology.

Adequate meteorological data.

Storm conditions.

Herring fisheries.

Effects of ice scouring on pipelines.

Transportation. The use of tankers.

Suggested option to the southern deletion alternative: Deletion of the first two tiers of tracts north of the Yukon River.

Janet Shantz of the Association of Village Presidents (AVCP) made a formal presentation on behalf of 56 villages in tbe Yukon-Kuskokwim Delta witb respect to the proposed Norton Sound and Navarin Basin sales.

The following lists the main points:

Delay the sale for five years. The AVCP stated tbat it is not opposed to eventual leasing and development of the area, but tbat leasing as proposed by the DOI would "irreparably barm the people and tbe environment adjacent to tbe lease areas." Tbe suggested 5-year delay would allow for:

(1) Development of technology for an area where there is "beavy and consistent ice pack movement for eigbt montbs of tbe year."

(2) Protection of salmon, berring, and otber marine resources. The Yukon River is an economic base for a commercial catch of salmon and a source of food for the villages located on the river.

(3) Time for villages to prepare for exploration and development; to plan in terms of land use, bousing and support facilities. Develop understanding of the process.

(4) Time to complete a CZM plan for the Yukon-Kuskokwim Delta.

The following resolutions were also presented at the IPP meeting:

(1) Caleb Pungowiyi of Kawerak, Inc., presented a resolution dated March 19, 1980, stating:

"The Bering Straits Native Association/Kawerak, Inc., strongly urges the Secretary of Interior to seriously consider the deletion of these tracts from any oil and gas development."

Clarification by Mr. Pungowiyi was made to Elaine Pratt at the Elders' Conference in Nome (April 3, 1980). Mr. Pungowiyi stated that tbe resolution requests the adoption of all tract deletion alternatives that have been proposed. Tbis resolution is based on potential impact to the subsistence hunting and fishing lifestyle of the people, lack of technology to develop the area in a safe and reasonable manner, heavy use of the Norton Sound area by marine mammals; residents are heavily dependent upon wildlife and marine resources; and, the impacts of an oilspill on habitat and resources of the area.

Evaluation of this option clearly sbows the number of blocks remaining in the proposed lease area would tben be 76. This would not be a viable alternative and would equate to the "no sale" alternative.

(2) Mayor Leo Rasmussen of Nome presented a resolution by the Nome Common Council stating:

". . . that the City of Nome endorse the orderly development of oil exploration in an environmentally sound fashion in the Norton Sound Basin."

This resolution was based on the intent of tbe city of Nome to be prepared for the impact of oil development in the Sound; orderly development would be beneficial to scbool, utilities, and all businesses in the city of Nome; and that the city is willing to work with agencies that will assist Nome in the procedures of orderly development.

b. Informal meeting at the Center for the Environment, April 9, 1980. Issues of concern expressed by the attendees include:

Adequacy of oilspill cleanup technology.

Local hire problems and the possibilility of discrimination by oil companies.

A mitigating measure was suggested at the meeting that the oil companies should demonstrate an "effective cleanup mobilization plan" for eacb site.

No alternatives to tbe proposal were suggested.

c. A scoping meeting was held for Federal and state agencies on April 15, 1980. Issues of concern include the following:

Influx of people to the area with competition for subsistence resources would create social stress.

Vessel traffic during exploration, especially supply and support activities.

Use of ice breakers on a stable winter regime.

Sensitive habitat of the Yukon River Delta.
-Waterfowl use of the area.
-Availability of adequate cleanup equipment and technology.

Possible gravel sites; impacts of excavation and fill.

Identification of critical onshore sites.

Eastern portion of the Sound would be vulnerable to an oilspill.

Impact from development on potential bottomfisbing industry.

Effects of disturbance on marine mammals.

Freshwater requirements for industry (low flow in the rivers during winter months).

State of Alaska oil and gas lease sale proposed for the Yukon River Delta.

U.S. Fish and Wildlife Service confirmed their position on scoping issues as tbose addressed in previous correspondence.

A comment was made by a Geological Survey representative that favored the proposed Norton Sound sale.

d. A meeting for tbe general public was held April 16, 1980, at Central Junior Higb School. Issues of concern include:

Marine mammals, including walrus, endangered species, and bowhead migrations through the southwest area.

Concern was expressed regarding:

Birds.

Salmon and herring.

Secondary impacts on marine mammals and fisheries.

Ice, especially the confluence off the Yukon River Delta.

Storm waves.

Seismic hazards; faults.

Chronic pollution and major oilspills.

Cleanup technology.

Need to complete the CZM plan for the area.

Social impacts on the infrastructure of small villages.

Enclave or aelf-contained base of operations should be considered.

Inadequate data base to proceed with proposed action.

Current and circulation data that will be available in the decision-making process.

A discussion of mitigating measures included the suggestion that seaaonal operating restrictions be considered and assessed for both the aummer and winter seasons.

The following alternatives to the proposal were discusaed:

(1) Minimum delay of three years to complete a CZM plan.

(2) Twenty-mile buffer zone around the Yukon River Delta.

(3) Deletion of all blocks except for the central area. This would be conaidered a "no sale" alternative as previously discussed.

5. A scoping meeting was held in Juneau, Alaska, to encourage additional scoping participation by Federal and state agencies, as well as the general public. The meeting was held April 23 at the Capitol Building. Issues of concern include:

The Acouatical Society of America expressed concern regarding acoustic diaturbance of birds, terrestrial mammals, and endangered marine mammals.

The U.S. Coast Guard atated the following as issues of concern:

Potential conflict between users.

Oilspill trajectories and sensitive or critical coastal areas.

Oilspill cleanup techniques.
- -Chemical diapersanta.
- -Cleanup equipment and procedures (referring to USGS and EPA atudiea).
- -Cleanup storage equipment.

Potential navigation problems in Port Clarence due to inadequacy of Loran C installation.

Tbe State of Alaska referenced previous correspondence on Norton Sound, and added the following:

Consistency issue on Coastal Zone Management.

Geohazards in Norton Sound, especially offshore of the Yukon River Delta.

A mitigating measure suggested by the Coast Guard was that in the event of a commercial find on a lease and, if users' conflicts were to develop, then the Coast Guard would reserve the legal right to determine fairways designation.

The discussion of alternatives to the proposal included:

a. The delay-of-sale alternative should include a discussion of the benefits of doing more research.

b. A cost/benefit study of alternatives should be included in the EIS.

c. Deletion alternatives should include all blocks requested for deletion by the State of Alaska in their letter of November 1, 1979.

Refer to Sections I.F. and V.B. of this environmental impact statement for a brief summary of major scoping issues, possible mitigating measures, and alternatives to the proposal identified through the scoping process, as well as a brief sketch of the total scoping process for lease sale 57.

APPENDIX I

ALASKA OCS ENVIRONMENTAL STUDIES PROGRAM

Prepared by
The Alaska OCS Office

Norton Basin (Sale 57)

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
003	Arneson, Paul	Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska		X					
005	Feder, Howard	Distribution, Abundance, Community Structure, and Trophic Relationships of the Nearshore Benthos	X	X					X
013	Braham, Howard	Behavior and Reproduction of the Pacific Walrus		X					
014	Braham, Howard	Distribution of the Pacific Walrus		X					
019	Renart, Ronald	Herring Spawning Surveys - Southern Bering Sea			X				
029	Atlas, Ronald	Assessment of Potential Interactions of Microorganisms and Pollutants from Petroleum Development in Bering and Chukchi Seas					X	X	
034	Ray, Carleton Wartozok, Douglas	Analysis of Marine Mammal Remote Sensing Data		X					
043	Chesler, Steven	Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for a) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, b) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons		X					
047	Lafleur, Philip Hertz, H. S. Chesler, S. N. Basnes, I. L. Becker, D. A.	Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements		X					
059	Hayes, Miles Boothroyd, Jon	Coastal Morphology, Sedimentation, and Oilspill Vulnerability						X	
062	Devries, Arttrus	The Physiological Effects of Acute and Chronic Exposure to Hydrocarbons and of Petroleum on the Nearshore Fishes of the Bering Sea		X					
067	Fiscus, Clifford Roppel, Alton	Baseline Characterization Marine Mammals	X	X					

Norton Basin (Sale 57)--Continued

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
068	Fiscus, Clifford Harry, George	Abundance and Seasonal Distribution of Marine Mammals						X	X
069	Fiscus, Clifford McAlister, Bruce	Resource Assessment Abundance and Seasonal Distribution of Bowhead and Beluga Whales - Bering Sea		X					
078	Zimmerman, Steven	Baseline Characterization: Littoral Biota, Bering Sea		X	X				
079	Zimmerman, Steven	Baseline Characterization: Littoral Biota, Bering Sea		X					
087	Martin, Seelye	The Interaction of Oil with Sea Ice				X		X	X
088/ 562	Weeks, W. F. Kovacs, A.	Dynamics of Nearshore Sea Ice			X	X		X	X
111	Carlson, Robert	Seasonability and Variability of Streamflow Important to Alaskan Nearshore Coastal Areas	X	X					
113	Not Listed Under Any Year				X				
140/ 146/ 149	Galt, J. A.	Numerical Studies of Alaskan Region - FY 77			X				
152	Feely, Richard Cline, Joel	Transport Mechanisms and Hydrocarbons Adsorption Properties of Suspended Matter				X	X	X	
153	Cline, Joel Feely, Richard	Sources, Composition and Dynamics of Natural and Petrogenic Light Hydrocarbons				X	X	X	
156/ 164	Alexander, V.	Phytoplankton Studies	X	X					
162	Burrell, David	Natural Distribution of Trace Heavy Metals and Environmental Background in 3 Alaskan Shelf Areas		X					
175	Pereyra, Walter	Summarize Existing Literature and Unpublished Data on the Distribution, Abundance, and Productivity of Demersal Fish, Shellfish, and Other Epibenthic Organisms	X	X	X				

Norton Basin (Sale 57)--Continued

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
190	Griffiths, Robert Morita, Richard	Study of Microbial Activity and Crude Oil Microbial Interactions in the Waters and Sediments of Cook Inlet, Norton Sound, and the Beaufort Sea					X	X	
194	Fay, Francis	Morbidity and Mortality of Key Marine Mammal Species	X	X	X	X		X	
196/ 330	Divoky, George	Distribution, Abundance, and Feeding Ecology of Birds Associated with Sea Ice	X	X	X	X	X	X	X
204	Hopkins, David	Offshore Permafrost Studies, Beaufort Sea						X	
208	Dupre, William	Yukon Delta Coastal Processes Study		X	X		X		
230	Burns, John Frost, Kathryn	The Natural History and Ecology of the Bearded Seal, Erignathus Barbatus, and the Ringed Seal, Phoca (Pusa) Hispida		X	X	X	X		
231	Burns, John	An Aerial Census of Spotted Seals, Phoca Vitulina Largha		X					
232	Lowry, Lloyd Burns, John	Trophic Relationships Among Ice-Inhabiting Phocid Seals and Functionally Related Marine Mammals		X		X	X	X	
237	Drury, William	Ecology of Seabirds in the Bering Straits Region	X	X	X	X	X	X	X
248/ 248	Burns, John Fay, Francis Shapiro, Lewis	The Relationships of Marine Mammal Distributions, Densities, and Activities to Sea Ice Conditions	X	X	X	X			
253	Osterkamp, T. E. Harrison, W. D.	Subsea Permafrost: Probing, Thermal Regime and Data Analysis						X	
257/ 258	Stringer, W. J.	Morphology of Beaufort, Chukchi and Bering Sea Nearshore Ice Condition by Means of Satellite and Aerial Remote Sensing			X	X			
267	Belon, Albert	Operation of an Alaskan Facility for Application of Remote - Sensing Data to OCS Studies			X	X	X		
275	Shaw, D. G.	Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf	X	X	X	X			

Norton Basin (Sale 57)--Continued

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
282/ 301	Feder, Howard	Summarization of Existing Literature and Unpublished Data on the Distribution, Abundance and Productivity of Benthic Organisms of the Gulf of Alaska and Bering Sea		X					
284	Smith, Ronald	Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and the Bering Sea		X					
285	Morrow, James	Preparation of Illustrated Keys to Skeletal Remains and Otoliths of Forage Fishes - Gulf of Alaska and Bering Sea		X					
289	Royer, Thomas	Circulation of Water Masses in the Gulf of Alaska				X			
290	Hoskin, Charles	Grain Size Analysis of Sediment from Alaskan Continental Shelves				X			
291	Hoskin, Charles	Grain Size Analysis and Data Reduction of Bering Sea Bottom Sediments				X			
307	Munch, Robin	Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program		X					
332	McCain, Bruce	Determine the Incidence and Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea and Beaufort Sea		X	X				
337	Lensink, Cal Bartonek, James	Seasonal Distribution and Abundance of Marine Birds		X		X			
339	Lensink, Cal	Review and Analysis of Literature and Unpublished Data on Marine Birds		X					
340	Lensink, Cal Bartonek, James	Migration of Birds in Alaskan Coastal and Marine Habitats Subject to Influence by OCS Development		X					
342	Lensink, Cal	Population Dynamics of Marine Birds	X						
343	Lensink, Cal Bartonek, James	Preliminary Catalog of Seabird Colonies		X					
347	Searby, Harold Brower, Willaim	Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas	X	X	X				

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
349	English, Tom	Alaska Marine Ichthyoplankton Key		X					
354	Pereyra, Walter Macy, Paul	Review of Literature and Archived Data for Non-Salmonid Pelagic Fishes of the Easter Bering Sea		X					
359	English, Tom	Plankton Studies							X
367	Reynolds, Michael Walter, A. B.	Mesoscale Meteorology						X	
429	Nelson, C. Hans	Gas-Charged Sediment, Erosion and Deposition Hazards on the Norton Seafloor			X	X		X	X
430	Cacchione, David	Bottom and Near-Bottom Sediment Dynamics: Norton Basin				X			
431	Sallenger, Asbury Ralph, John	Coastal Processes of the Eastern Bering Sea				X			
435	Leendertse, Jan	Modeling of Tides and Circulations of the Bering Sea (Phase IV)				X	X	X	X
460	Springer, Alan Roseneau, David Murphy, Ed	Ecological Studies of Seabird at Cape Thompson and Cape Lisburne, Alaska						X	X
470	Johnson, S. R. Searing, G. F.	Studies of Populations, Community Structure, and Ecology of Marine Birds at Southwest Cape, St. Lawrence Island			X				
480	Kaplan, I. R. Venkatesen, M. I.	Characterization of Organic Matter in Sediments from Gulf of Alaska, Bering and Beaufort Seas			X	X		X	
483	Biswas, N. N. Gedney, L. D.	Part I. Evaluation of Earthquake Activity Around Norton and Kotzebue Sounds Part II. Seismic Attenuation Studies			X	X	X	X	X
488	Lensink, Calvin Jones, Robert	Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea			X				
541	Schumacher, James Coachman, Lawrence	Norton Sound/Chukchi Sea Oceanographic Processes			X	X	X	X	
549	Schumacher, James	Southeastern Bering Sea Oceanographic Processes						X	

Norton Basin (Sale 57)--Continued

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
562/ 88	Kovaks, Austin	Oil Pooling Under Sea Ice					X	X	
567	Coon, Max Pritchard, Robert	The Transport and Behavior of Oil Spilled in and under Sea Ice (Task I)						X	
583	Aagaard, Knut	Under Ice Currents in Norton Sound					X		
586	Biswas, U/A	Compilation of Homogeneous Earthquake Catalog for the Alaska-Aleutian Region						X	
589	Hampton, USGS	Sediment Geotechnical Studies on the Alaskan Continental Shelf						X	
593	Nerini, NWAFC	Feeding of the Gray Whale in Norton Sound						X	
596	Overland	Southeast Bering Sea Meteorological Processes							X
597	Payne	Oil Weathering Experiments - Sub-Arctic							X
607	Van Baalen	Diodegradation of Aromatic Hydrocarbons by High Latitude Microalgae and Cynobacteris							X
611	Fay, U/A, IMS	Modern Populations, Migrations, Demography, Trophics, and Historical Status of the Pacific Walrus in Alaska							X
612	Burns, AFO/APO	Biological Investigations of Beluga Whales in the Coastal Waters of Alaska							X
613	Burns, ADF&G	Investigations of Ice-Dependent Marine Mammals in the Coastal Zone During Summer and Autumn							X
1044	APO	Acquisition by Side-Looking Radar Imagery							X
--	BLM	Winter Habitat Use by Bowhead Whales						X	X
--	BLM	Development of Large Cetacean Tagging and Tracking Capability in the Alaskan OCS Lease Areas						X	X
--	BLM	Effects of Non-Biological Underwater Noise on Gray and Killer Whales						X	X

Norton Basin (Sale 57)--Continued

Research Unit Number	Principal Investigator	Title of Study	Years of Study 75	76	77	78	79	80	81
--	BLM	Collection and Analysis of National Marine Fisheries Service Marine Mammals Platforms of Opportunity Program Data (POP)						X	X
--	BLM	Habitat Use by Humpback, Gray, and Fin Whales in the Gulf of Alaska						X	X
--	BLM	Investigation of the Occurrence, Population Density, and Behavior Patterns of Endangered Whales in the Beaufort and Bering Seas						X	X
--	BLM	Possible Effects of Acoustics and Other Stimuli Associated with Oil and Gas Exploration and Development on the Behavior of Bowhead Whales						X	X
--	BLM	Prediction of Low Frequency Noise from Coastal Oil and Gas Drilling Operations in the Beaufort Sea						X	X
--	BLM	Gray Whale Feeding Biology						X	X
--	BLM	Habitat Use by Gray Whales in Nelson Lagoon						X	X

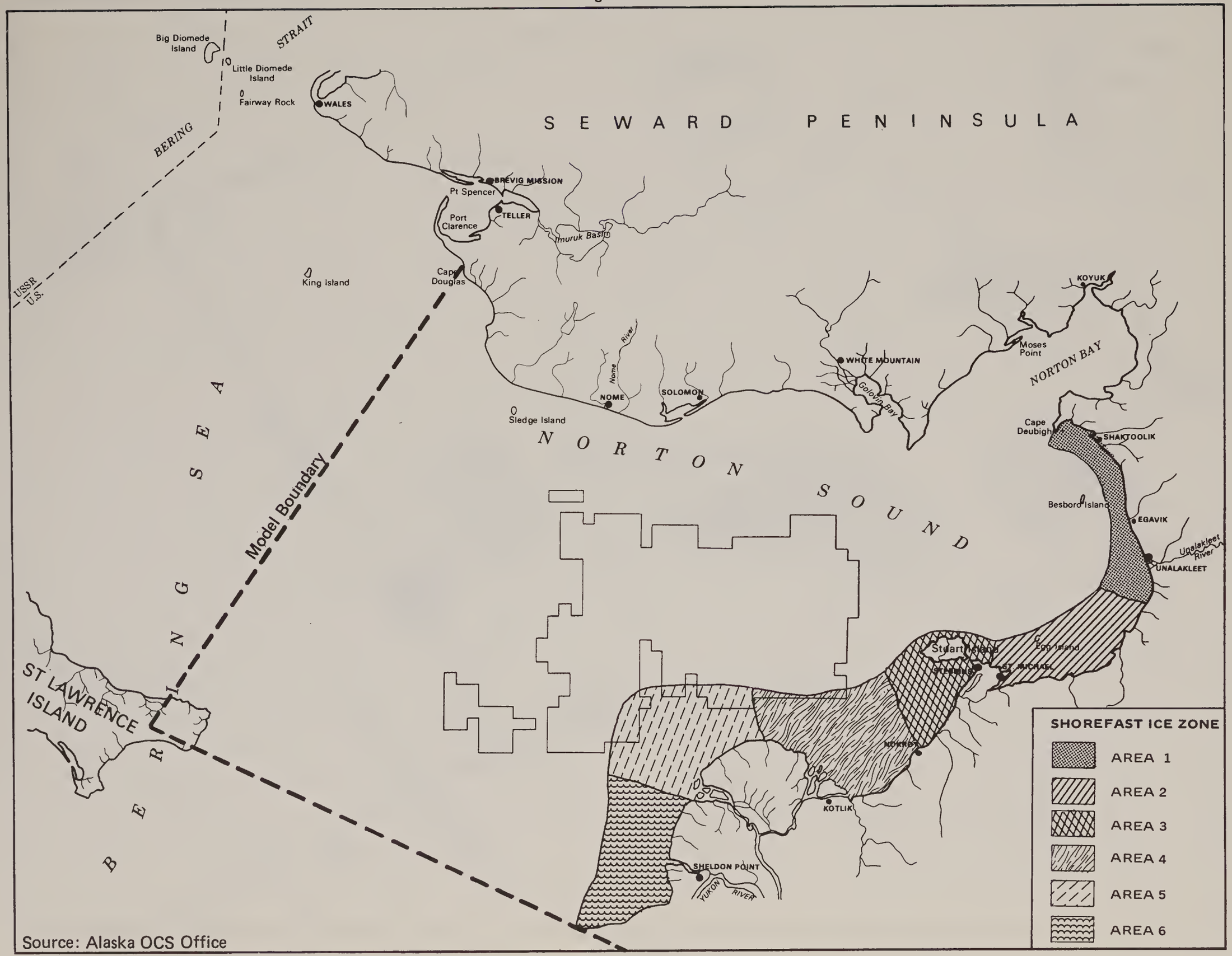
APPENDIX J

OILSPILL RISK ANALYSIS

Requested by
The Alaska OCS Office

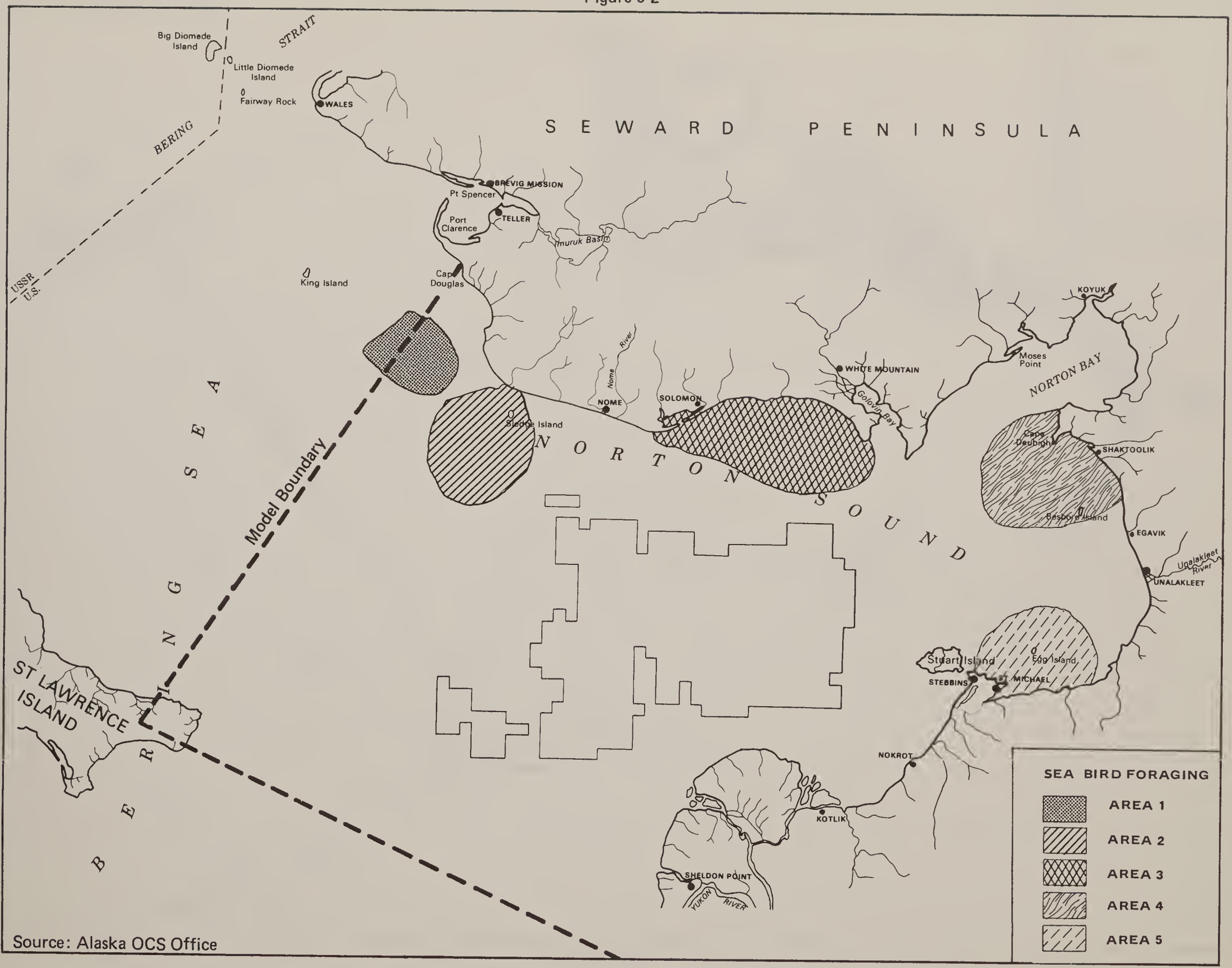
Prepared by
U.S. Geological Survey

Figure J-1



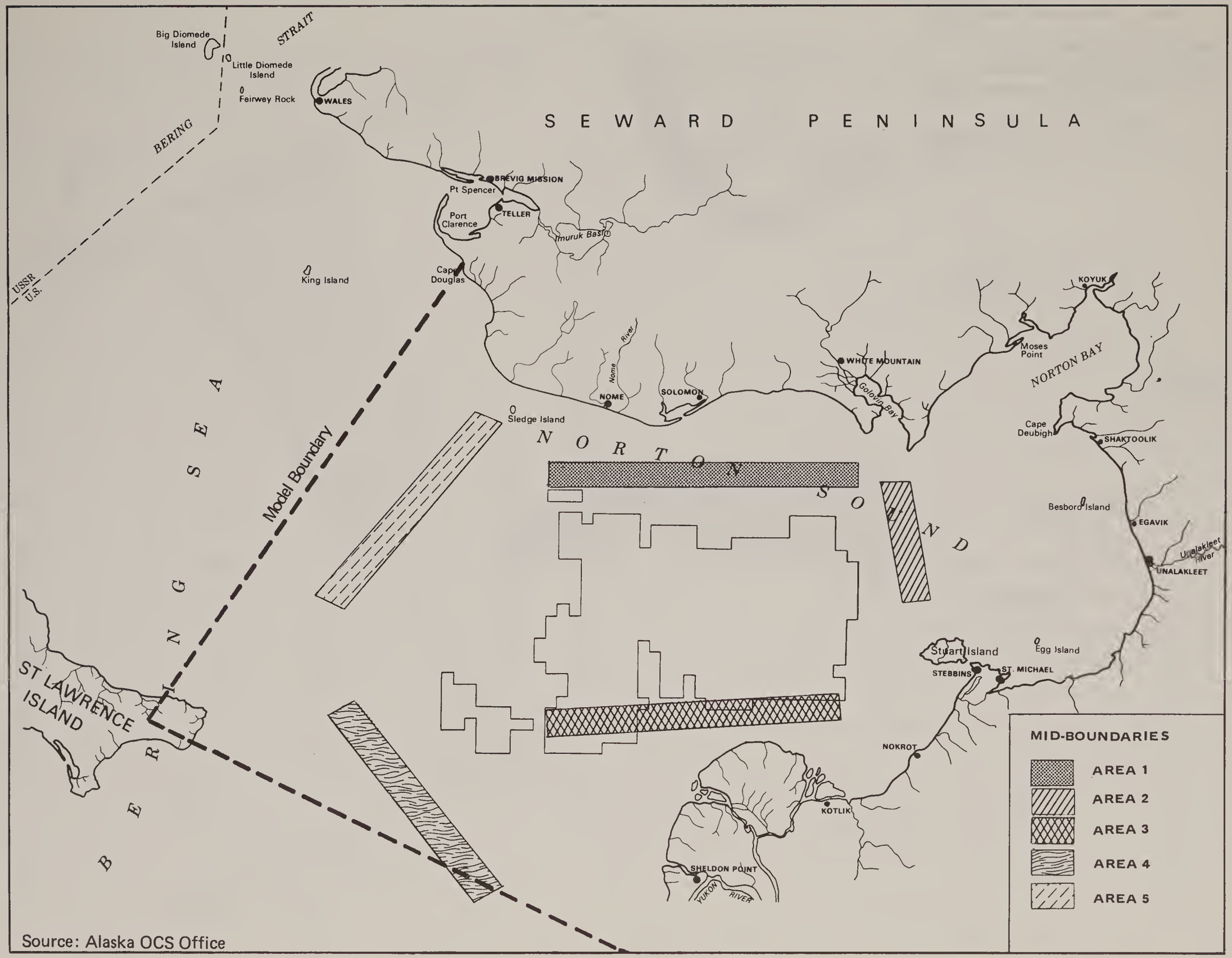
Source: Alaska OCS Office

Figure J-2



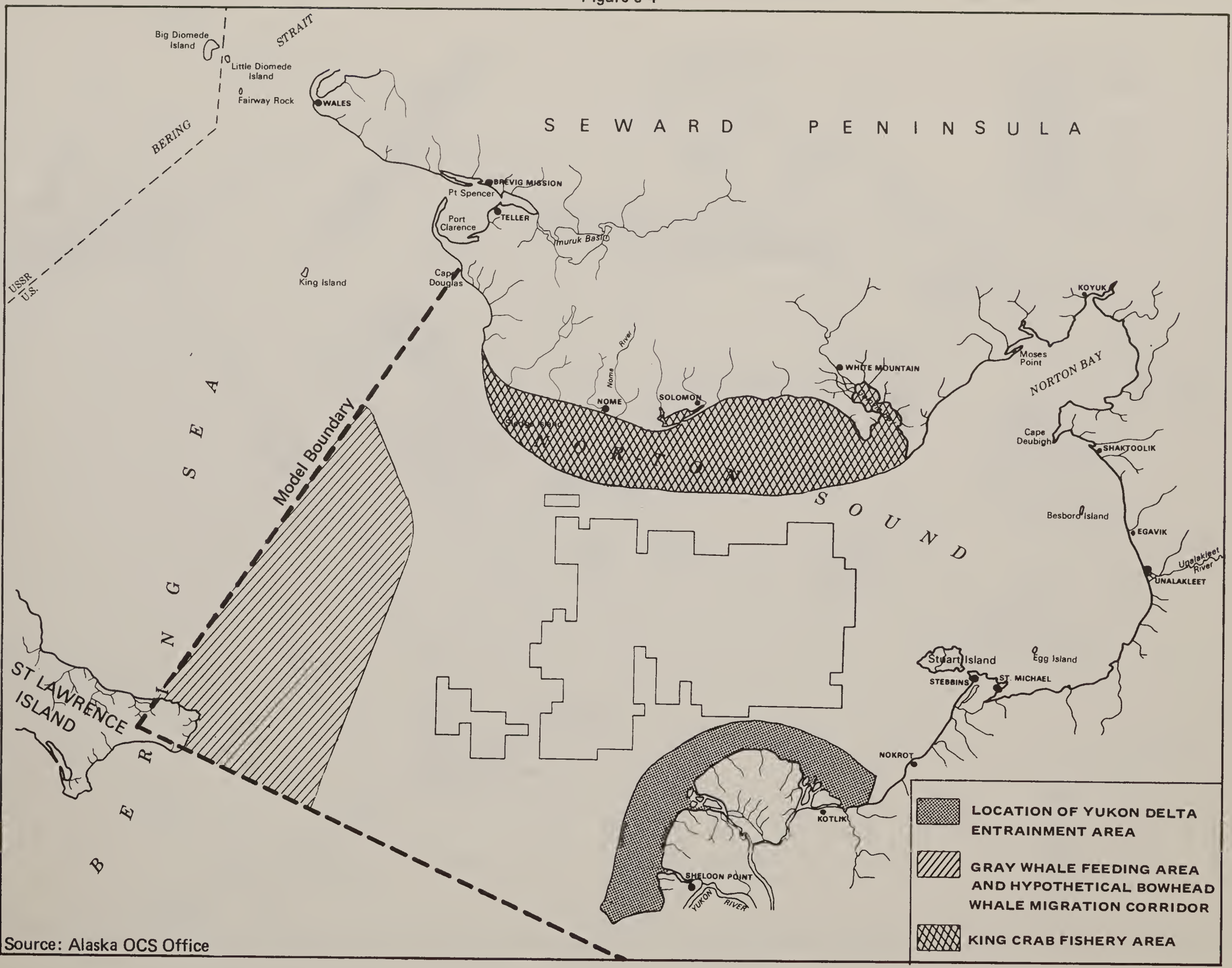
Source: Alaska OCS Office

Figure J-3



Source: Alaska OCS Office

Figure J-4



Source: Alaska OCS Office

Table 1. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain target within 3 days.

Target	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Land	n	n	n	3	n	n	6	3	n	n	n	n	n	n	3	1	n	n	n	n
Ice zone 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 4	n	n	n	45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 5	n	n	50	40	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 1 Sum.	n	n	n	n	1	8	50	22	16	6	n	1	3	12	50	17	1	n	n	n
Mid. Bnd. 2 Sum.	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 3 Sum.	n	30	28	27	5	n	n	n	n	n	5	14	2	n	n	n	n	5	n	n
Mid. Bnd. 4 Sum.	20	2	n	n	n	n	n	n	n	n	n	2	n	n	n	n	2	15	7	5
Mid. Bnd. 5 Sum.	n	n	n	n	n	n	n	n	n	n	n	n	n	3	2	3	13	2	16	2
Mid. Bnd. 1 Wint.	n	n	n	n	5	10	50	15	5	n	n	n	n	n	50	n	n	n	n	n
Mid. Bnd. 2 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 3 Wint.	n	5	35	30	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 4 Wint.	45	25	10	5	5	n	n	n	n	n	5	5	n	n	n	n	n	20	n	n
Mid. Bnd. 5 Wint.	n	5	15	5	n	15	15	10	25	20	15	15	20	25	25	35	45	5	20	n
Sbd. For. 1 Sum.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
Sbd. For. 2 Sum.	n	n	n	n	n	n	n	2	2	n	n	n	n	4	3	13	9	n	1	n
Sbd. For. 3 Sum.	n	n	n	n	1	11	21	22	5	3	n	n	n	n	2	n	n	n	n	n
Sbd. For. 4 Sum.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 5 Sum.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 1 Wint.	n	n	n	5	n	n	n	15	5	5	5	n	n	n	10	n	n	n	n	n
Sbd. For. 2 Wint.	n	n	n	5	n	10	15	30	20	10	5	n	n	20	40	40	n	n	n	n
Sbd. For. 3 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 4 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 5 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
King Crab Sum.	n	n	n	n	1	12	50	50	17	7	1	1	2	11	50	17	2	n	n	n
Yukon Delta Sum.	n	1	7	17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gray Whale Area	32	20	20	n	5	5	5	10	15	15	15	25	25	20	10	25	47	32	75	**

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 2. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain target within 10 days.

Target	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Land	7	6	13	17	14	20	21	19	10	6	9	4	4	8	13	13	4	7	4	1
Ice zone 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 4	n	n	n	45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 5	n	n	50	40	20	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 1 Sum.	4	4	5	1	6	9	50	28	24	16	11	9	12	18	50	22	9	5	2	n
Mid. Bnd. 2 Sum.	n	1	4	16	18	15	4	n	1	4	4	1	n	1	1	n	n	n	n	n
Mid. Bnd. 3 Sum.	9	31	31	27	22	15	5	n	7	17	22	17	3	n	2	n	4	10	4	n
Mid. Bnd. 4 Sum.	25	17	5	n	n	n	n	2	10	2	n	20	22	17	13	10	13	22	7	13
Mid. Bnd. 5 Sum.	1	n	2	n	n	2	2	7	7	2	2	3	2	8	5	11	16	4	21	5
Mid. Bnd. 1 Wint.	n	n	n	n	5	10	50	20	5	n	n	n	n	n	50	n	n	n	n	n
Mid. Bnd. 2 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 3 Wint.	n	5	40	40	20	10	n	n	n	5	10	n	n	n	n	n	n	n	n	n
Mid. Bnd. 4 Wint.	50	45	30	30	30	15	10	5	10	15	25	30	15	5	5	5	n	30	n	n
Mid. Bnd. 5 Wint.	n	5	15	5	10	30	35	30	40	30	15	15	25	40	40	45	45	5	20	n
Sbd. For. 1 Sum.	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	3	1	3	2
Sbd. For. 2 Sum.	2	n	n	n	n	2	5	7	2	n	n	1	2	4	3	13	11	3	7	3
Sbd. For. 3 Sum.	n	1	5	2	9	13	23	25	17	15	10	2	2	9	13	6	n	n	n	n
Sbd. For. 4 Sum.	n	n	n	n	n	4	2	n	1	1	n	n	n	n	n	n	n	n	n	n
Sbd. For. 5 Sum.	n	n	1	3	3	1	n	n	n	n	1	n	n	n	n	n	n	n	n	n
Sbd. For. 1 Wint.	n	n	n	5	n	n	n	15	5	5	5	n	n	n	10	n	n	n	n	n
Sbd. For. 2 Wint.	n	n	n	5	n	10	25	45	25	10	5	n	n	20	40	40	n	n	n	n
Sbd. For. 3 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 4 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 5 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
King Crab Sum.	4	6	5	3	9	14	50	50	23	17	12	11	12	18	50	22	11	6	2	n
Yukon Delta Sum.	9	6	17	22	17	7	n	n	n	5	7	n	n	n	n	n	1	5	5	2
Gray Whale Area	52	32	30	15	30	35	32	40	47	37	32	45	47	60	45	62	70	62	78	**

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 3. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain target within 30 days.

Target	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Land	18	22	32	37	35	37	32	25	25	27	30	23	22	22	24	22	17	20	18	11
Ice zone 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 4	n	n	n	45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 5	n	n	50	45	20	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice zone 6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 1 Sum.	11	8	7	1	6	9	50	28	24	17	12	16	17	21	50	22	15	13	11	6
Mid. Bnd. 2 Sum.	6	11	12	16	18	15	5	3	6	9	11	10	8	5	5	4	5	4	2	2
Mid. Bnd. 3 Sum.	9	31	31	27	22	15	7	n	7	17	22	17	3	n	2	n	4	10	5	8
Mid. Bnd. 4 Sum.	25	17	13	5	13	5	10	7	13	15	7	22	22	17	15	13	13	22	7	13
Mid. Bnd. 5 Sum.	1	n	2	n	2	10	10	15	10	5	5	3	2	8	7	11	16	4	21	6
Mid. Bnd. 1 Wint.	n	n	n	n	5	10	50	20	5	n	n	n	n	n	50	n	n	n	n	n
Mid. Bnd. 2 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Mid. Bnd. 3 Wint.	n	5	40	40	20	10	n	n	n	5	10	n	n	n	n	n	n	n	n	n
Mid. Bnd. 4 Wint.	50	45	35	40	35	15	10	5	10	15	25	30	15	5	5	5	n	30	n	n
Mid. Bnd. 5 Wint.	n	5	15	5	10	30	35	30	40	30	15	15	25	40	40	45	45	5	20	n
Sbd. For. 1 Sum.	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	3	1	3	3
Sbd. For. 2 Sum.	2	n	n	n	n	2	5	7	2	n	n	1	2	4	3	13	11	3	8	4
Sbd. For. 3 Sum.	5	8	8	2	9	13	23	25	17	16	13	12	13	14	13	12	8	10	9	4
Sbd. For. 4 Sum.	n	6	9	11	12	10	7	2	7	9	8	4	4	3	3	2	4	2	1	1
Sbd. For. 5 Sum.	1	2	4	5	4	4	n	n	n	3	5	1	1	n	n	1	1	1	1	1
Sbd. For. 1 Wint.	n	n	n	5	n	n	n	15	5	5	5	n	n	n	10	n	n	n	n	n
Sbd. For. 2 Wint.	n	n	n	5	n	10	25	45	25	10	5	n	n	20	40	40	n	n	n	n
Sbd. For. 3 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 4 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sbd. For. 5 Wint.	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
King Crab Sum.	12	11	8	4	9	14	50	50	23	18	17	18	20	23	50	24	16	16	13	8
Yukon Delta Sum.	9	6	17	22	20	7	2	n	n	5	7	n	n	n	n	n	2	5	6	7
Gray Whale Area	52	37	37	17	37	47	47	55	57	50	42	50	52	62	55	65	72	62	78	**

Note: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 4. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain land or sea segment within 3 days.

Land or Sea Segment	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
5	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	n	n	n	n	n	1	3	n	n	n	n	n	n	n	n	n	n	n	n
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n	n
23	n	n	n	n	n	n	5	n	n	n	n	n	n	n	n	1	n	n	n	n
25	n	n	n	5	n	n	n	5	5	5	n	n	n	n	5	1	n	n	n	n
26	n	n	5	n	n	n	10	15	5	n	5	n	n	10	10	10	n	n	n	n
27	n	n	n	n	n	n	5	n	5	5	n	5	5	5	5	10	5	n	n	n
28	n	5	n	n	n	n	n	n	5	5	n	10	10	5	n	5	15	5	5	n
29	10	5	n	n	n	n	n	n	n	n	n	n	5	n	n	n	5	10	20	n
30	5	5	n	n	n	n	n	n	n	n	5	5	n	n	n	n	n	5	5	5
31	10	5	5	n	n	n	n	n	n	n	n	5	n	n	n	n	n	5	n	47
32	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table 5. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain land or sea segment within 10 days.

Land or Sea Segment	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
1	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
3	3	n	2	n	n	n	n	n	n	n	5	n	n	n	n	n	n	1	1	n
4	2	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	3	1	1
5	1	2	2	7	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
7	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
9	n	n	2	3	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
17	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
18	n	n	n	2	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n
19	n	n	2	n	2	5	11	3	1	2	1	n	n	n	n	n	n	n	n	n
20	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	n	n	1	1	1	6	14	6	3	2	n	n	n	4	n	n	n	n	n
22	n	1	1	n	n	n	n	1	1	n	1	4	3	6	7	8	n	n	n	n
23	1	1	n	n	5	5	5	1	2	1	n	n	1	2	2	5	4	3	2	n
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n
25	2	n	n	5	n	n	n	5	5	5	n	1	1	1	5	1	3	1	3	2
26	n	n	5	n	n	n	10	17	5	n	5	n	n	10	10	10	n	n	n	1
27	n	n	n	n	n	10	5	15	5	10	n	5	5	7	17	12	5	n	n	n
28	n	5	n	2	5	5	15	5	20	5	10	12	10	15	10	20	27	5	5	n
29	10	7	5	7	n	5	5	n	n	15	n	n	10	10	n	n	10	12	27	n
30	7	5	5	5	15	5	n	n	5	n	20	10	10	n	n	5	7	10	30	15
31	27	15	15	5	5	5	n	5	10	5	n	15	5	10	10	5	5	25	7	57
32	17	12	5	15	5	n	5	n	2	10	10	10	15	2	2	2	5	7	2	7
33	7	17	10	n	5	5	n	n	n	n	5	7	2	n	n	n	n	2	n	n
34	n	2	n	n	n	n	n	n	n	2	n	2	n	n	n	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table 6. -- Probabilities (expressed as percent chance) that an oilspill starting at a particular location will contact a certain land or sea segment within 30 days.

Land or Sea Segment	Hypothetical Spill Location																			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
1	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
2	n	n	n	n	n	2	2	n	n	2	n	n	n	n	n	n	n	n	n	n
3	3	n	2	n	2	n	n	n	n	n	5	n	n	n	n	n	n	1	2	1
4	2	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	3	2	3
5	1	2	2	7	n	5	n	n	n	n	n	n	n	n	n	n	n	n	n	1
6	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
7	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	1	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
9	1	1	2	3	3	n	n	n	n	n	1	2	2	n	n	n	n	2	1	n
11	1	2	3	7	6	2	1	n	1	3	5	2	2	1	n	n	1	n	n	n
12	n	2	5	4	1	3	1	n	3	3	n	2	n	n	n	1	n	2	n	n
13	n	1	4	3	6	4	5	n	1	n	5	1	n	1	2	1	1	n	n	n
14	n	n	n	n	2	n	n	1	1	1	2	n	n	n	n	n	n	n	n	n
15	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n
16	n	2	1	1	n	2	1	n	n	2	n	n	n	n	n	n	n	n	n	n
17	1	n	n	2	3	3	n	2	2	n	1	3	2	n	1	n	1	n	n	n
18	2	2	1	4	1	5	1	n	1	5	3	3	3	2	1	n	n	1	n	n
19	1	2	4	n	2	5	11	5	6	7	5	4	6	5	3	4	2	5	1	2
20	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	1	2	1	1	1	1	6	14	8	4	3	3	2	6	8	4	3	1	6	2
22	2	2	1	n	n	n	n	1	1	n	1	4	4	6	7	8	3	n	1	1
23	3	2	n	n	5	5	5	1	2	1	n	n	2	2	2	5	7	6	4	n
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	1
25	2	n	n	5	n	n	n	5	5	5	n	1	1	1	5	1	3	1	3	3
26	n	n	5	n	n	n	10	17	5	n	5	n	n	10	10	10	n	n	n	1
27	n	n	n	2	2	10	7	17	7	10	n	5	5	7	17	12	5	n	n	n
28	n	5	n	2	5	7	20	7	22	7	10	12	12	15	15	22	27	5	5	n
29	10	7	5	10	2	10	7	5	2	20	5	n	10	15	n	2	12	12	27	n
30	12	10	10	5	17	12	2	10	10	5	25	15	15	7	10	15	17	17	30	15
31	27	15	17	5	12	7	10	5	15	7	2	20	10	12	12	7	7	27	7	57
32	17	17	7	27	10	7	5	2	5	12	12	12	17	5	2	2	5	7	5	7
33	7	17	20	5	12	5	2	2	n	2	5	7	2	2	2	2	n	5	n	n
34	n	2	2	n	n	2	2	2	2	2	5	2	2	n	n	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table 7. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease tracts using onshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	2	0	0.0	1	0	0.0	27	0	0.3	12	0	0.1	51	0	0.7	26	0	0.3
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	6	0	0.1	3	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. 8nd. 1 Sum.	25	0	0.3	10	0	0.1	35	0	0.4	16	0	0.2	39	0	0.5	18	0	0.2
Mid. 8nd. 2 Sum.	n	0	0.0	n	0	0.0	11	0	0.1	4	0	0.0	19	0	0.2	8	0	0.1
Mid. Bnd. 3 Sum.	3	0	0.0	1	0	0.0	21	0	0.2	9	0	0.1	23	0	0.3	10	0	0.1
Mid. 8nd. 4 Sum.	3	0	0.0	2	0	0.0	16	0	0.2	8	0	0.1	27	0	0.3	13	0	0.1
Mid. Bnd. 5 Sum.	7	0	0.1	4	0	0.0	16	0	0.2	8	0	0.1	23	0	0.3	11	0	0.1
Mid. Bnd. 1 Wint.	17	0	0.2	6	0	0.1	19	0	0.2	7	0	0.1	19	0	0.2	7	0	0.1
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	1	0	0.0	1	0	0.0	11	0	0.1	5	0	0.0	11	0	0.1	5	0	0.0
Mid. Bnd. 4 Wint.	3	0	0.0	1	0	0.0	26	0	0.3	11	0	0.1	27	0	0.3	12	0	0.1
Mid. Bnd. 5 Wint.	38	0	0.5	20	0	0.2	53	0	0.8	28	0	0.3	53	0	0.8	28	0	0.3
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Sbd. For. 2 Sum.	6	0	0.1	3	0	0.0	11	0	0.1	6	0	0.1	12	0	0.1	6	0	0.1
Sbd. For. 3 Sum.	15	0	0.2	6	0	0.1	26	0	0.3	11	0	0.1	32	0	0.4	15	0	0.2
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	14	0	0.1	6	0	0.1
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	5	0	0.0	2	0	0.0
Sbd. For. 1 Wint.	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0
Sbd. For. 2 Wint.	30	0	0.4	14	0	0.1	36	0	0.4	16	0	0.2	36	0	0.4	16	0	0.2
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	34	0	0.4	15	0	0.2	43	0	0.6	20	0	0.2	48	0	0.6	23	0	0.3
Yukon Delta Sum.	n	0	0.0	n	0	0.0	11	0	0.1	5	0	0.0	13	0	0.1	6	0	0.1
Gray Whale Area	50	0	0.7	31	0	0.4	75	1	1.4	47	0	0.6	80	1	1.6	52	0	0.7

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 8. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease tracts using offshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	n	0	0.0	n	0	0.0	22	0	0.2	9	0	0.1	53	0	0.8	27	0	0.3
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	2	0	0.0	1	0	0.0	9	0	0.1	3	0	0.0	9	0	0.1	3	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	6	0	0.1	2	0	0.0	22	0	0.3	10	0	0.1	28	0	0.3	13	0	0.1
Mid. 8nd. 2 Sum.	n	0	0.0	n	0	0.0	15	0	0.2	6	0	0.1	25	0	0.3	11	0	0.1
Mid. Bnd. 3 Sum.	11	0	0.1	5	0	0.1	36	0	0.4	17	0	0.2	37	0	0.5	17	0	0.2
Mid. Bnd. 4 Sum.	5	0	0.1	3	0	0.0	18	0	0.2	10	0	0.1	30	0	0.4	15	0	0.2
Mid. Bnd. 5 Sum.	1	0	0.0	1	0	0.0	8	0	0.1	4	0	0.0	13	0	0.1	6	0	0.1
Mid. Bnd. 1 Wint.	4	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	2	0	0.0	1	0	0.0	19	0	0.2	7	0	0.1	19	0	0.2	7	0	0.1
Mid. Bnd. 4 Wint.	11	0	0.1	6	0	0.1	44	0	0.6	22	0	0.3	46	0	0.6	23	0	0.3
Mid. Bnd. 5 Wint.	28	0	0.3	13	0	0.1	37	0	0.5	17	0	0.2	37	0	0.5	17	0	0.2
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Sbd. For. 2 Sum.	1	0	0.0	n	0	0.0	3	0	0.0	2	0	0.0	3	0	0.0	2	0	0.0
Sbd. For. 3 Sum.	4	0	0.0	1	0	0.0	19	0	0.2	8	0	0.1	27	0	0.3	13	0	0.1
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	17	0	0.2	7	0	0.1
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	8	0	0.1	3	0	0.0
Sbd. For. 1 Wint.	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0
Sbd. For. 2 Wint.	12	0	0.1	5	0	0.0	12	0	0.1	5	0	0.0	12	0	0.1	5	0	0.0
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	8	0	0.1	3	0	0.0	26	0	0.3	12	0	0.1	35	0	0.4	17	0	0.2
Yukon Delta Sum.	n	0	0.0	n	0	0.0	17	0	0.2	7	0	0.1	19	0	0.2	8	0	0.1
Gray Whale Area	47	0	0.6	28	0	0.3	71	1	1.2	44	0	0.6	76	1	1.4	48	0	0.7

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 9 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the north deletion alternative using onshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	1	0	0.0	n	0	0.0	15	0	0.2	6	0	0.1	32	0	0.4	15	0	0.2
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	1	0	0.0	1	0	0.0	5	0	0.1	2	0	0.0	5	0	0.1	2	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	12	0	0.1	5	0	0.0	19	0	0.2	8	0	0.1	22	0	0.2	10	0	0.1
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	7	0	0.1	3	0	0.0	12	0	0.1	5	0	0.0
Mid. Bnd. 3 Sum.	3	0	0.0	1	0	0.0	14	0	0.2	6	0	0.1	15	0	0.2	6	0	0.1
Mid. Bnd. 4 Sum.	1	0	0.0	1	0	0.0	9	0	0.1	4	0	0.0	16	0	0.2	7	0	0.1
Mid. Bnd. 5 Sum.	4	0	0.0	2	0	0.0	9	0	0.1	4	0	0.0	12	0	0.1	6	0	0.1
Mid. Bnd. 1 Wint.	8	0	0.1	3	0	0.0	9	0	0.1	3	0	0.0	9	0	0.1	3	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	1	0	0.0	1	0	0.0	8	0	0.1	3	0	0.0	8	0	0.1	3	0	0.0
Mid. Bnd. 4 Wint.	3	0	0.0	1	0	0.0	18	0	0.2	8	0	0.1	20	0	0.2	8	0	0.1
Mid. Bnd. 5 Wint.	21	0	0.2	10	0	0.1	30	0	0.4	14	0	0.2	30	0	0.4	14	0	0.2
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
Sbd. For. 2 Sum.	3	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0	6	0	0.1	3	0	0.0
Sbd. For. 3 Sum.	7	0	0.1	3	0	0.0	14	0	0.1	5	0	0.1	18	0	0.2	8	0	0.1
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
Sbd. For. 1 Wint.	5	0	0.1	2	0	0.0	5	0	0.1	2	0	0.0	5	0	0.1	2	0	0.0
Sbd. For. 2 Wint.	15	0	0.2	6	0	0.1	18	0	0.2	8	0	0.1	18	0	0.2	8	0	0.1
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	17	0	0.2	7	0	0.1	24	0	0.3	10	0	0.1	28	0	0.3	13	0	0.1
Yukon Delta Sum.	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0	9	0	0.1	4	0	0.0
Gray Whale Area	32	0	0.4	18	0	0.2	51	0	0.7	29	0	0.3	57	0	0.8	32	0	0.4

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 10 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the north deletion alternative using offshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	n	0	0.0	n	0	0.0	12	0	0.1	5	0	0.1	34	0	0.4	16	0	0.2
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	2	0	0.0	1	0	0.0	8	0	0.1	3	0	0.0	8	0	0.1	3	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	1	0	0.0	n	0	0.0	11	0	0.1	5	0	0.0	15	0	0.2	7	0	0.1
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	9	0	0.1	3	0	0.0	15	0	0.2	6	0	0.1
Mid. Bnd. 3 Sym.	7	0	0.1	3	0	0.0	23	0	0.3	10	0	0.1	24	0	0.3	11	0	0.1
Mid. Bnd. 4 Sum.	3	0	0.0	2	0	0.0	10	0	0.1	5	0	0.1	18	0	0.2	9	0	0.1
Mid. Bnd. 5 Sum.	1	0	0.0	n	0	0.0	3	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0
Mid. Bnd. 1 Wint.	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	2	0	0.0	1	0	0.0	13	0	0.1	5	0	0.1	13	0	0.1	5	0	0.1
Mid. Bnd. 4 Wint.	8	0	0.1	4	0	0.0	30	0	0.4	14	0	0.2	32	0	0.4	15	0	0.2
Mid. Bnd. 5 Wint.	13	0	0.1	6	0	0.1	17	0	0.2	8	0	0.1	17	0	0.2	8	0	0.1
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 2 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
Sbd. For. 3 Sum.	n	0	0.0	n	0	0.0	9	0	0.1	4	0	0.0	15	0	0.2	7	0	0.1
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	10	0	0.1	4	0	0.0
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	5	0	0.0	2	0	0.0
Sbd. For. 1 Wint.	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
Sbd. For. 2 Wint.	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	1	0	0.0	1	0	0.0	13	0	0.1	6	0	0.1	20	0	0.2	9	0	0.1
Yukon Oelta Sum.	n	0	0.0	n	0	0.0	11	0	0.1	5	0	0.0	13	0	0.1	5	0	0.1
Gray Whale Area	29	0	0.3	16	0	0.2	47	0	0.6	26	0	0.3	52	0	0.7	29	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table11 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the south deletion alternative using onshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	2	0	0.0	1	0	0.0	27	0	0.3	12	0	0.1	51	0	0.7	26	0	0.3
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	6	0	0.1	3	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	25	0	0.3	10	0	0.1	35	0	0.4	16	0	0.2	39	0	0.5	18	0	0.2
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	11	0	0.1	4	0	0.0	19	0	0.2	8	0	0.1
Mid. Bnd. 3 Sum.	3	0	0.0	1	0	0.0	21	0	0.2	9	0	0.1	23	0	0.3	10	0	0.1
Mid. Bnd. 4 Sum.	3	0	0.0	2	0	0.0	16	0	0.2	8	0	0.1	27	0	0.3	13	0	0.1
Mid. Bnd. 5 Sum.	7	0	0.1	4	0	0.0	16	0	0.2	8	0	0.1	23	0	0.3	11	0	0.1
Mid. Bnd. 1 Wint.	17	0	0.2	6	0	0.1	19	0	0.2	7	0	0.1	19	0	0.2	7	0	0.1
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	1	0	0.0	1	0	0.0	11	0	0.1	5	0	0.0	11	0	0.1	5	0	0.0
Mid. Bnd. 4 Wint.	3	0	0.0	1	0	0.0	26	0	0.3	11	0	0.1	27	0	0.3	12	0	0.1
Mid. Bnd. 5 Wint.	38	0	0.5	20	0	0.2	53	0	0.8	28	0	0.3	53	0	0.8	28	0	0.3
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Sbd. For. 2 Sum.	6	0	0.1	3	0	0.0	11	0	0.1	6	0	0.1	12	0	0.1	6	0	0.1
Sbd. For. 3 Sum.	15	0	0.2	6	0	0.1	26	0	0.3	11	0	0.1	32	0	0.4	15	0	0.2
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	14	0	0.1	6	0	0.1
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	5	0	0.0	2	0	0.0
Sbd. For. 1 Wint.	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0
Sbd. For. 2 Wint.	30	0	0.4	14	0	0.1	36	0	0.4	16	0	0.2	36	0	0.4	16	0	0.2
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	34	0	0.4	15	0	0.2	43	0	0.6	20	0	0.2	48	0	0.6	23	0	0.3
Yukon Oelta Sum.	n	0	0.0	n	0	0.0	11	0	0.1	5	0	0.0	13	0	0.1	6	0	0.1
Gray Whale Area	50	0	0.7	31	0	0.4	75	1	1.4	47	0	0.6	80	1	1.6	52	0	0.7

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table12 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the south deletion alternative using offshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	n	0	0.0	n	0	0.0	22	0	0.2	9	0	0.1	53	0	0.8	27	0	0.3
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	2	0	0.0	1	0	0.0	9	0	0.1	3	0	0.0	9	0	0.1	3	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	6	0	0.1	2	0	0.0	22	0	0.3	10	0	0.1	28	0	0.3	13	0	0.1
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	15	0	0.2	6	0	0.1	25	0	0.3	11	0	0.1
Mid. Bnd. 3 Sum.	11	0	0.1	5	0	0.1	36	0	0.4	17	0	0.2	37	0	0.5	17	0	0.2
Mid. Bnd. 4 Sum.	5	0	0.1	3	0	0.0	18	0	0.2	10	0	0.1	30	0	0.4	15	0	0.2
Mid. Bnd. 5 Sum.	1	0	0.0	1	0	0.0	8	0	0.1	4	0	0.0	13	0	0.1	6	0	0.1
Mid. Bnd. 1 Wint.	4	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	2	0	0.0	1	0	0.0	19	0	0.2	7	0	0.1	19	0	0.2	7	0	0.1
Mid. Bnd. 4 Wint.	11	0	0.1	6	0	0.1	44	0	0.6	22	0	0.3	46	0	0.6	23	0	0.3
Mid. Bnd. 5 Wint.	28	0	0.3	13	0	0.1	37	0	0.5	17	0	0.2	37	0	0.5	17	0	0.2
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Sbd. For. 2 Sum.	1	0	0.0	n	0	0.0	3	0	0.0	2	0	0.0	3	0	0.0	2	0	0.0
Sbd. For. 3 Sum.	4	0	0.0	1	0	0.0	19	0	0.2	8	0	0.1	27	0	0.3	13	0	0.1
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	17	0	0.2	7	0	0.1
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	8	0	0.1	3	0	0.0
Sbd. For. 1 Wint.	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0
Sbd. For. 2 Wint.	12	0	0.1	5	0	0.0	12	0	0.1	5	0	0.0	12	0	0.1	5	0	0.0
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	8	0	0.1	3	0	0.0	26	0	0.3	12	0	0.1	35	0	0.4	17	0	0.2
Yukon Oelta Sum.	n	0	0.0	n	0	0.0	17	0	0.2	7	0	0.1	19	0	0.2	8	0	0.1
Gray Whale Area	47	0	0.6	28	0	0.3	71	1	1.2	44	0	0.6	76	1	1.4	48	0	0.7

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table13 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the east deletion alternative using onshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	11	0	0.1	5	0	0.1
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	7	0	0.1	3	0	0.0	10	0	0.1	4	0	0.0	12	0	0.1	5	0	0.0
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
Mid. Bnd. 3 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Mid. Bnd. 4 Sum.	1	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0	8	0	0.1	4	0	0.0
Mid. Bnd. 5 Sum.	2	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0
Mid. Bnd. 1 Wint.	4	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 4 Wint.	n	0	0.0	n	0	0.0	4	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0
Mid. Bnd. 5 Wint.	11	0	0.1	5	0	0.1	16	0	0.2	7	0	0.1	16	0	0.2	7	0	0.1
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 2 Sum.	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
Sbd. For. 3 Sum.	2	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0	8	0	0.1	3	0	0.0
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 1 Wint.	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Sbd. For. 2 Wint.	9	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	9	0	0.1	3	0	0.0	12	0	0.1	5	0	0.0	14	0	0.2	6	0	0.1
Yukon Delta Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
Gray Whale Area	16	0	0.2	8	0	0.1	28	0	0.3	14	0	0.1	30	0	0.4	15	0	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table14 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the east deletion alternative using offshore transportation scenario.

Target	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	12	0	0.1	5	0	0.1
Ice zone 1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 5	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Ice zone 6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 1 Sum.	2	0	0.0	1	0	0.0	5	0	0.1	2	0	0.0	8	0	0.1	3	0	0.0
Mid. Bnd. 2 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0
Mid. Bnd. 3 Sum.	8	0	0.1	4	0	0.0	8	0	0.1	4	0	0.0	8	0	0.1	4	0	0.0
Mid. Bnd. 4 Sum.	1	0	0.0	n	0	0.0	10	0	0.1	5	0	0.0	10	0	0.1	5	0	0.0
Mid. Bnd. 5 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Mid. Bnd. 1 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 2 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Mid. Bnd. 3 Wint.	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
Mid. Bnd. 4 Wint.	6	0	0.1	3	0	0.0	14	0	0.2	7	0	0.1	14	0	0.2	7	0	0.1
Mid. Bnd. 5 Wint.	8	0	0.1	3	0	0.0	10	0	0.1	4	0	0.0	10	0	0.1	4	0	0.0
Sbd. For. 1 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 2 Sum.	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
Sbd. For. 3 Sum.	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0
Sbd. For. 4 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
Sbd. For. 5 Sum.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
Sbd. For. 1 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 2 Wint.	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
Sbd. For. 3 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 4 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Sbd. For. 5 Wint.	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
King Crab Sum.	2	0	0.0	1	0	0.0	6	0	0.1	2	0	0.0	9	0	0.1	4	0	0.0
Yukon Delta Sum.	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
Gray Whale Area	12	0	0.1	5	0	0.1	22	0	0.2	10	0	0.1	24	0	0.3	11	0	0.1

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table15 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease tracts using onshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
3	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
5	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
15	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
18	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0
19	n	0	0.0	n	0	0.0	5	0	0.1	2	0	0.0	11	0	0.1	5	0	0.0
21	1	0	0.0	1	0	0.0	9	0	0.1	4	0	0.0	13	0	0.1	6	0	0.1
22	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0	5	0	0.0	2	0	0.0
23	1	0	0.0	n	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
25	4	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0	6	0	0.1	3	0	0.0
26	12	0	0.1	5	0	0.1	13	0	0.1	6	0	0.1	13	0	0.1	6	0	0.1
27	7	0	0.1	3	0	0.0	17	0	0.2	8	0	0.1	19	0	0.2	8	0	0.1
28	8	0	0.1	4	0	0.0	23	0	0.3	11	0	0.1	26	0	0.3	13	0	0.1
29	5	0	0.1	3	0	0.0	15	0	0.2	7	0	0.1	22	0	0.2	11	0	0.1
30	3	0	0.0	2	0	0.0	21	0	0.2	11	0	0.1	33	0	0.4	17	0	0.2
31	8	0	0.1	5	0	0.1	21	0	0.2	11	0	0.1	27	0	0.3	14	0	0.1
32	n	0	0.0	n	0	0.0	12	0	0.1	6	0	0.1	18	0	0.2	8	0	0.1
33	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0	9	0	0.1	4	0	0.0
34	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table16 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease tracts using offshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	6	0	0.1	2	0	0.0
4	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
5	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0
18	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	7	0	0.1	3	0	0.0
19	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	11	0	0.1	5	0	0.1
21	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0
22	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0
23	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0
25	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
26	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0
27	4	0	0.0	2	0	0.0	8	0	0.1	3	0	0.0	9	0	0.1	4	0	0.0
28	7	0	0.1	3	0	0.0	19	0	0.2	9	0	0.1	20	0	0.2	9	0	0.1
29	3	0	0.0	2	0	0.0	10	0	0.1	5	0	0.0	18	0	0.2	8	0	0.1
30	8	0	0.1	4	0	0.0	29	0	0.3	14	0	0.1	38	0	0.5	19	0	0.2
31	12	0	0.1	8	0	0.1	25	0	0.3	15	0	0.2	32	0	0.4	18	0	0.2
32	n	0	0.0	n	0	0.0	20	0	0.2	9	0	0.1	26	0	0.3	12	0	0.1
33	n	0	0.0	n	0	0.0	10	0	0.1	4	0	0.0	14	0	0.1	6	0	0.1
34	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table17 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the north deletion alternative using onshore transportation scenario.

Segment	Within 3 days ≥ 1000 bbls.			Within 3 days ≥ 10000 bbls.			Within 10 days ≥ 1000 bbls.			Within 10 days ≥ 10000 bbls.			Within 30 days ≥ 1000 bbls.			Within 30 days ≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
19	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	6	0	0.1	2	0	0.0
21	1	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	7	0	0.1	3	0	0.0
22	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0
25	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
26	7	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
27	3	0	0.0	1	0	0.0	7	0	0.1	3	0	0.0	9	0	0.1	4	0	0.0
28	4	0	0.0	2	0	0.0	13	0	0.1	6	0	0.1	15	0	0.2	7	0	0.1
29	3	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0	10	0	0.1	5	0	0.0
30	2	0	0.0	1	0	0.0	15	0	0.2	8	0	0.1	22	0	0.2	11	0	0.1
31	5	0	0.0	3	0	0.0	11	0	0.1	6	0	0.1	16	0	0.2	8	0	0.1
32	n	0	0.0	n	0	0.0	8	0	0.1	4	0	0.0	12	0	0.1	5	0	0.1
33	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	6	0	0.1	2	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table18 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the north deletion alternative using offshore transportation scenario.

Segment	Within 3 days ≥ 1000 bbls.			Within 3 days ≥ 10000 bbls.			Within 10 days ≥ 1000 bbls.			Within 10 days ≥ 10000 bbls.			Within 30 days ≥ 1000 bbls.			Within 30 days ≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.1	2	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.1	2	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
19	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	6	0	0.1	2	0	0.0
21	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
25	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
26	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
27	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
28	3	0	0.0	2	0	0.0	11	0	0.1	5	0	0.0	11	0	0.1	5	0	0.1
29	2	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	7	0	0.1	3	0	0.0
30	5	0	0.0	2	0	0.0	21	0	0.2	9	0	0.1	26	0	0.3	12	0	0.1
31	7	0	0.1	4	0	0.0	14	0	0.2	8	0	0.1	19	0	0.2	10	0	0.1
32	n	0	0.0	n	0	0.0	12	0	0.1	6	0	0.1	16	0	0.2	7	0	0.1
33	n	0	0.0	n	0	0.0	6	0	0.1	3	0	0.0	9	0	0.1	4	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	1	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table19 . -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the south deletion alternative using onshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
3	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
5	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
15	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
18	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0
19	n	0	0.0	n	0	0.0	5	0	0.1	2	0	0.0	11	0	0.1	5	0	0.0
21	1	0	0.0	1	0	0.0	9	0	0.1	4	0	0.0	13	0	0.1	6	0	0.1
22	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0	5	0	0.0	2	0	0.0
23	1	0	0.0	n	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
25	4	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0	6	0	0.1	3	0	0.0
26	12	0	0.1	5	0	0.1	13	0	0.1	6	0	0.1	13	0	0.1	6	0	0.1
27	7	0	0.1	3	0	0.0	17	0	0.2	8	0	0.1	19	0	0.2	8	0	0.1
28	8	0	0.1	4	0	0.0	23	0	0.3	11	0	0.1	26	0	0.3	13	0	0.1
29	5	0	0.1	3	0	0.0	15	0	0.2	7	0	0.1	22	0	0.2	11	0	0.1
30	3	0	0.0	2	0	0.0	21	0	0.2	11	0	0.1	33	0	0.4	17	0	0.2
31	8	0	0.1	5	0	0.1	21	0	0.2	11	0	0.1	27	0	0.3	14	0	0.1
32	n	0	0.0	n	0	0.0	12	0	0.1	6	0	0.1	18	0	0.2	8	0	0.1
33	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0	9	0	0.1	4	0	0.0
34	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table20. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the south deletion alternative using offshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	6	0	0.1	2	0	0.0
4	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
5	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	3	0	0.0
14	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0
18	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	7	0	0.1	3	0	0.0
19	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	11	0	0.1	5	0	0.1
21	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0
22	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0
23	n	0	0.0	n	0	0.0	5	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0
25	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
26	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0	6	0	0.1	2	0	0.0
27	4	0	0.0	2	0	0.0	8	0	0.1	3	0	0.0	9	0	0.1	4	0	0.0
28	7	0	0.1	3	0	0.0	19	0	0.2	9	0	0.1	20	0	0.2	9	0	0.1
29	3	0	0.0	2	0	0.0	10	0	0.1	5	0	0.0	18	0	0.2	8	0	0.1
30	8	0	0.1	4	0	0.0	29	0	0.3	14	0	0.1	38	0	0.5	19	0	0.2
31	12	0	0.1	8	0	0.1	25	0	0.3	15	0	0.2	32	0	0.4	18	0	0.2
32	n	0	0.0	n	0	0.0	20	0	0.2	9	0	0.1	26	0	0.3	12	0	0.1
33	n	0	0.0	n	0	0.0	10	0	0.1	4	0	0.0	14	0	0.1	6	0	0.1
34	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table 21. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the east deletion alternative using onshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
17	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
19	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
21	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
25	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
26	4	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0
27	2	0	0.0	1	0	0.0	5	0	0.0	2	0	0.0	5	0	0.0	2	0	0.0
28	3	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
29	2	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0
30	n	0	0.0	n	0	0.0	3	0	0.0	2	0	0.0	7	0	0.1	3	0	0.0
31	2	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
32	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

Table 22. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the east deletion alternative using offshore transportation scenario.

Segment	Within 3 days						Within 10 days						Within 30 days					
	≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.			≥ 1000 bbls.			≥ 10000 bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
19	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
21	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
26	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0
27	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
28	4	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0	5	0	0.1	2	0	0.0
29	2	0	0.0	1	0	0.0	4	0	0.0	2	0	0.0	5	0	0.1	2	0	0.0
30	1	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0
31	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1	3	0	0.0
32	1	0	0.0	1	0	0.0	6	0	0.1	3	0	0.0	8	0	0.1	4	0	0.0
33	n	0	0.0	n	0	0.0	5	0	0.1	2	0	0.0	5	0	0.1	3	0	0.0
34	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown

APPENDIX K

NORTON SOUND OILSPILL SCENARIOS

Requested by
The Alaska OCS Office

Prepared by
Alaska Oil and Gas Association (AOGA)
and the
Alaskan Beaufort Sea Oilspill Response
Body (ABSORB)

NORTON SOUND OIL SPILL SCENARIOS

INTRODUCTION

The oil production industry's first line of defense of the environment is to not have oil spills. Great amounts of attention are placed on the proper selection of equipment and in training to prevent oil spills. The oil industry does not wish to have oil spills since spilled oil is the most costly oil the oil industry can produce. The following scenarios illustrate how expensive that oil could be to the company that spilled the oil.

In order to demonstrate oil industry concepts of how oil would be cleaned up in the Norton Sound area, two worst case scenarios were studied. One scenario is a high volume short term blowout during late open water season where the produced fluids were not ignited. Ignition of the oil would be an environmental protection consideration if the blowout was to become long term. The other scenario is a production phase scenario where a large volume of oil is spilled under ice in the absence of produced gas.

I. Pre-Spill Contingency Factors

It is to be pointed out that the factors listed below are not all inclusive. The equipment mentioned herein is 'state-of-the-art' however, it is possible that better variations of equipment and better techniques will be developed between now and the time of deployment for the Norton Sound and industry will want freedom to beneficially utilize such progress.

In order to realistically study oil spill scenarios, a list of pre-spill contingency factors need to be assumed for the Norton Sound as follows:

1. There is an oil industry supported oil spill cleanup organization for the Norton Sound.

2. There is an oil spill contingency plan. It is assumed that this plan will have oil spill trajectory analyses in it and will have an Atlas depicting and rating the coastlines in terms of oil spill sensitivity. This plan would also have a map depicting submarine pipeline routes.

3. There is a trained response team.

4. The oil spill contingency plan has studied a series of worst case oil spill scenarios as well as several usual case scenarios. An example of a usual case scenario is a broken hose occurring during a fuel oil transfer from a supply vessel to the drilling rig. The worst case scenarios would cover each of the seasons (freeze-up, winter, break-up and open water).

5. There is an oil spill cleanup organization warehouse in Nome containing a certain amount of "first wave" oil spill response material. This material amount and type has been determined by study of the above mentioned scenarios. An example is air transportable (DeHavilland Twin Otter) response storage boxes containing shoreline protection equipment booms and anchor sets, sorbents, bird scare away equipment, hand tools, and EPA approved shoreline protection chemicals. A Twin Otter equipped with appropriate landing wheel tires can land on sandy and gravel beaches if no airstrip is nearby. Helicopters can sling load the boxes to the specific emplacement locations.

6. There are other warehouses operated by similar organizations in Alaska containing similar equipment that would serve as a "second wave response" to the emergency. This material is air transportable by Hercules aircraft (Lockheed C-130).

7. It is assumed that at least some of the helicopters used in support of the oil industry have IFR capability.

8. When production is established it is assumed that at least two of the supply vessels supporting the industry would have ice breaking capability.

II. Environmental Conditions

SEASON (Month)	OPEN WATER (OW) (October)	FREEZE-UP (FU) (November)	WINTER (W) (March)	BREAK-UP (BU) (June)
Currents	0.5 nautical miles per day	0.4 nautical miles per day	less than 0.4 nautical miles per day beneath ice	0.4 nautical miles per day
Winds (Climatic Atlas)	Mean speed 14 knots. 5% of time is over 34 knots. 40% of time is below 10 knots. Vector wind flow is about 5 knots toward southwest.	70% of time wind is at 9 knots or less out of N, NE, and E.	55% of time wind is at 7 knots or less out of N, NE, and E.	42% of time wind is at 8 knots or less out of W and SW.
Sea State	50% of time less than 5' 80% of time less than 8' 5% of time waves exceed 12' in height	Might have as high as a 2' swell	Ice covered	95% of time less than 8'
Air Temperature (Climatic Atlas)	Average 28°F Minimum 4° F Maximum 46° F	Average 18° F Minimum -22° F Maximum 39° F	Average 9° F Minimum -36° F Maximum 35° F	Average 49° F Minimum 28° F Maximum 71° F
Ice/Snow Conditions	Sea is free of ice in October	Thin slushy ice w/ice pancakes freezing into place solidly by end of month	Massive floes in some areas and 7 Oktas (7/8) ice coverage or concentration in balance of area. Ice could be rafted to 6' thickness. Sporadic transport up to 4 nautical miles per day.	Massive floes w/leads degrading to ice pan in size by end of break-up
Visibility	Less than 5% of time visibility is less than 2 nautical miles	Less than 15% of time visibility is less than 2 nautical miles	Less than 15% of time visibility is less than 2 nautical miles	Less than 10% of time visibility is less than 2 nautical miles

UNDER ICE OIL SPILL SCENARIO (A)

III-A. Spill Description

The spill source is a submarine pipeline. This would be a highly unlikely event, but for the sake of scenario development it is assumed that the pipeline ruptured due to a faulty weld that somehow survived visual inspection, X-raying and extensive hydrostatic testing at pressures considerably above the expected operating pressure. The break occurred March 1 with 10,000 barrels of a medium grade (Prudhoe Bay type) crude oil being released to the under-ice surface over a period of 12 hours. The break in the pipeline is located about 40 nautical miles southeast of Cape Nome. The Federal, State and local agencies that are the lead agencies for receiving this type of information have been notified.

IV-A. Spill Movement/Behavior

The release of 10,000 barrels of crude oil from a pipeline rupture approximately 40 nautical miles SE of Cape Nome is assumed to take place over a period of 12 hours. Using an average drift rate (for the overlying ice) of approximately 0.15 knots and an average oil thickness (beneath the ice) of a little over one inch, the resulting contamination would cover an area of about 13 acres. This region of subsurface oil accumulation would extend about 1.8 nautical miles from the source and would consist of a narrow band of oil approximately 50 feet wide.

Since subsurface currents are assumed to be less than 0.5 nautical miles/day (<1 cm/sec), the oil accumulation would not be displaced out of the natural pockets and other recesses of roughness that undersea ice is known to possess and would not be transported beyond its initial point of contact with the ice. If spill recovery efforts were not conducted, the region of contamination described above would drift slowly toward the southwest retaining its original size and configuration. Any cracks in the ice or newly formed leads would likely result in the release of small quantities of oil to the water surface--some oil might be pumped (by natural rocking motion of the ice) to the ice surface. Without extensive rupturing of the ice sheet (some of which might be rafted to a 6' thickness) the majority of the oil would gradually become encapsulated in the ice. The trapped oil would remain well offshore throughout the remainder of the winter and into spring.

Based upon BLM trajectory analyses, it is likely that the spring exposure of the subsurface oil would occur several tens of miles offshore. The break-up and ablation of the contaminated ice (≃ 13 acres) would result in the gradual exposure of oil in melt pools on floes or in the surface waters of cracks/leads well offshore.

V-A. Response

General Techniques

Immediately upon detection of a leak from the pipeline indicated by pressure sensing and flow monitoring equipment, spill reconnaissance teams would be released to monitor the surface of the ice along the length of the pipeline. Using helicopters and small fixed wing aircraft equipment would be deployed to make several measurements of the rate of ice drift along the pipeline. A method of monitoring ice movement would be to deploy passive radar targets to document ice motion. These targets are aluminum about the size of a dish on a wooden tripod. Observations to identify locations of surfacing oil would be made at the same time as ice movement is monitored.

To the extent possible, surface crews would traverse the length of the pipeline route affected, operating hydrocarbon detection equipment (impulse radar, sniffers, etc.) in a zig zag path. Should these techniques fail to identify the area of contaminated ice, ice breaking vessels could be deployed to break up that stretch of ice which was known to be overlying the pipeline on the day of the spill.

After locating the contaminated ice the area would be examined using the hydrocarbon detection equipment and ice augers as necessary. Subsurface, remote control devices and/or divers (if safe to do so) could also be utilized to confirm the extent of contamination. These techniques, together with subsurface lighting procedures (recently implemented in ABSORB R & D work) would provide useful data on the size and nature of subsurface pooling of the oil.

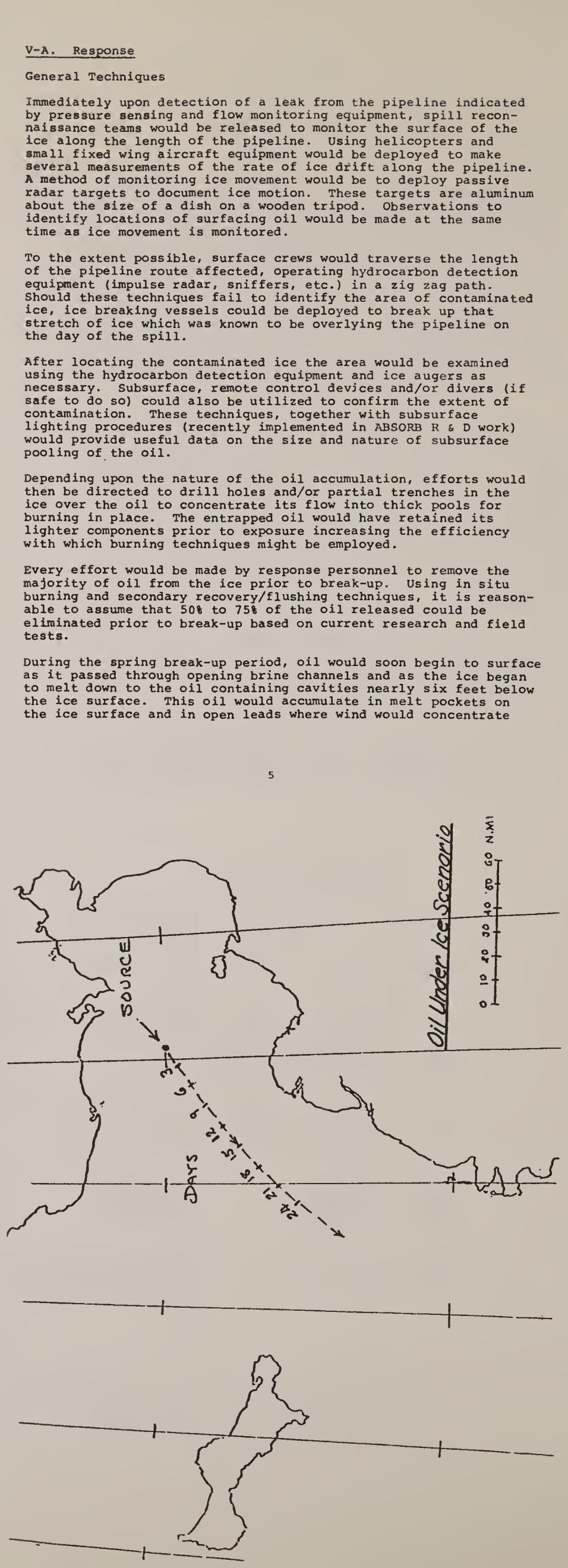
Depending upon the nature of the oil accumulation, efforts would then be directed to drill holes and/or partial trenches in the ice over the oil to concentrate its flow into thick pools for burning in place. The entrapped oil would have retained its lighter components prior to exposure increasing the efficiency with which burning techniques might be employed.

Every effort would be made by response personnel to remove the majority of oil from the ice prior to break-up. Using in situ burning and secondary recovery/flushing techniques, it is reasonable to assume that 50% to 75% of the oil released could be eliminated prior to break-up based on current research and field tests.

During the spring break-up period, oil would soon begin to surface as it passed through opening brine channels and as the ice began to melt down to the oil containing cavities nearly six feet below the ice surface. This oil would accumulate in melt pockets on the ice surface and in open leads where wind would concentrate

such slicks. Where oil concentrations are low, dispersants might be used to avoid potential damage to mammals and birds. With the aid of frequent fixed wing reconnaissance flights, helicopters could then be deployed to specific sites of high concentration in order to drop igniters on to the slicks. The residue from burning would be retrieved within the same day that burning occurs. Such treatment (burning and dispersants) would be used until open water operations could commence with vessels equipped with skimmers sorbents and/or dispersant application apparatus.

These early spring cleanup activities could easily account for the elimination of at least 50% of the remaining oil. Thus, winter and spring cleanup, together with natural degradation and evaporation, would likely result in less than 10 to 15% of the original 10,000 barrels remaining in the offshore waters upon the completion of break-up.



III-B. Spill Description

The spill is caused by a surface blowout which resulted from a mechanical failure. The blowout occurred October 5. The medium grade crude oil is sprayed into the atmosphere and falls onto the water surface at a rate of 3300 barrels per day. A total of 10,000 barrels is discharged over a 3 day period prior to regaining control of the well. The well is located in the southeast corner of the sale area. All non-essential personnel evacuate the rig to a workboat or to shore, by helicopter. The Federal, State and local agencies that are lead agencies for receiving this type of information have been notified.

IV-B. Spill Movement/Behavior

The near-freezing surface water causes a relatively thick slick. Estimated film thickness is about .1 inch. Assuming a .1 inch thickness, the areal extent covered by the slick will be extremely small, as shown below:

Time	Amount Discharged	Areal Extent
1 day	3,300 bbls	.08 miles^2
2 days	6,600 bbls	.16 miles^2
3 days	10,000 bbls	.24 miles^2

The 5 kt vector wind to the southwest combined with the small impact of current causes about 4 nm/d movement to the southwest. The areal extent of the slick will increase with time due to the gravitational flow and the spreading effect of the wind. The mean wind speed is 14 kts which will move the spill around significantly more than the net transport. Also, the wave and wind energy will promote natural dispersion of the oil and will tend to emulsify the slick. A significant amount of the oil will evaporate, both at the initial discharge through the air, and as the oil weathers on the water. Biodegradation is minimal during the cleanup period.

Storms out of the north and the southwest flow will drive the slick onshore in and around the Yukon Delta in the Clarence Rhode National Wildlife Refuge. Assuming 15% evaporated, 50% recovered by mechanical methods, and 10% naturally dispersed, then approximately 2500 barrels (25%) of the oil will remain to impact the shoreline. A substantial amount of the remaining oil could be chemically dispersed prior to hitting the beach. Depending on weather conditions, freeze-up will have started by mid-October with some coves possibly protected by new ice, which will impede the movement of oil onto the shore.

Considering that the spill will have to be transported a minimum of 20 miles to reach the shoreline, a 34 kt storm out of the northeast could move the entire slick ashore in less than one day. Some of the water soluble portion of the crude oil can be

assumed to be toxic. McAuliffe (see bibliography) states this toxicity concentration would drop to harmless levels for fish in less than one hour after having been spilled. Impact on the Yukon Delta shoreline in the event of a spill during a 34 kt storm with a possible accompanying 2.5 meter storm surge and the resulting oil spill cleanup response is covered in Section VI. The balance of scenario discussion in this Section V assumes average weather conditions to be present during the duration of the oil spill cleanup activity. In the absence of storm conditions, oil can be expected to reach the shoreline in about 5 days. Impact on the shoreline and cleanup response is covered in Section VI.

Status of the spill after various times is as follows:

Time	Status
3 days	Blowout controlled. Highest concentration of oil is at rig. Some oil nearing shoreline.
10 days	Most oil either on shoreline or blown out to sea.
30 days	All oil either on shoreline or dispersed in open water.

V-B. Response

General Techniques

At the time the spill occurs it is very likely that a boat will be available to immediately deploy the boom and skimmer kept at the rig. The boat operates the skimmer storing the skimmer product in internal tanks. Additional boats from other operator's rigs are called in to assist, along with their rig's booms and skimmers. The boats skim continuously and shuttle skimmer produce to another rig in the area for treatment through its contaminated oil drain treatment system. The oil-free water is discharged to the ocean and the oil is stored in fuel and ballast tanks. A burner is deployed on the nearby rig for disposing of the recovered oil.

Also, immediately after the spill occurs, dispersant chemical and additional boom skimmers and other supplies are sent out by boat from Nome. Small items and expert cleanup personnel are sent out by helicopter. At least one helicopter is sent out outfitted with dispersant application equipment that is normally warehoused in Nome.

A type of skimmer that could be stored at Nome and used to augment the rig skimmer could be the SOCK (Spilled Oil Containment Kit) skimmer that was originally developed for the Gulf of Alaska. It has been tested to skim over 200 gallons per minute in the Mexican oil spill and in its latest prototype has demonstrated good performance to 8' wave height. It utilizes vessels of convenience

without the need for retrofitting and operating personnel remain safely aboard the vessel at all times. This unit and its oil water separator are air deployable in a Hercules airplane. This skimmer has now reached a state of development where it is about to become a commercially manufactured item.

Other immediate action includes mobilizing a large supply of dispersant chemical, and application airplanes from outside the area. The dispersant airplanes and additional chemicals are flown to Nome to prepare for large-scale use in case mechanical cleanup becomes ineffective due to weather conditions. Also, weather forecasts are obtained from the National Weather Service for use with the trajectory analyses computer model to forecast spill movement and shoreline impact location. Response crews and beach cleanup equipment are mobilized to the Yukon Delta area.

The skimming operation continues at the rig with occasional boom replacement due to damage by the boats operating the skimmers. Small patches of oil that escape the boom are dispersed using dispersants applied from the boats and helicopters. Due to the thick layer of oil contained by the boom, skimming is highly efficient.

After the blowout has been controlled, the boom is detached from its anchor point around the rig and the small remaining slick is completely encircled. Skimming operations continue using the workboats. Small patches of oil remaining after the skimmers become ineffective due to small slick thickness, and are dispersed using chemicals.

In the event sea conditions preclude mechanical recovery, permission is obtained to apply chemical dispersants using airplanes. The application is highly effective for dispersing the oil and eliminating the impact on the shoreline.

Timetable of cleanup status:

Time	Status
3 days	Blowout controlled. Intense skimming inside containment boom. Open water patches being dispersed from helicopters or boats. Shoreline cleanup equipment and manpower mobilized.
10 days	Open water cleanup concluded. Dispersant application by airplane continuing if necessary.
30 days	All open water activity concluded. Freeze-up beginning. Shoreline cleanup continuing.

Logistics

In a remote area like the Norton Sound, normally each rig has two workboats. Usually one boat will be enroute or at the Nome dock, and one boat will be at the rig. Response time to the rig will be approximately 12 hours, based on 4 hours loading and 8 hours to travel the 80 miles at around 10 kts. Small items and all personnel are moved by IFR equipped helicopters, either internally or as external sling loads. All other boats and helicopters supporting exploration drilling elsewhere in the area will also be available to provide assistance.

Logistics for shoreline cleanup are by IFR helicopter and transport aircraft operating out of the Kotlik airstrip.

Resources

All of the equipment and techniques required are existing, proven and within the state-of-the-art. The type and amount of equipment required for summer cleanup is typical of exploration drilling in other open water areas. Other cleanup organizations in Alaska would make their warehouse stocks available for air transport to Nome as needed to back up withdrawals from the Nome warehouse. Other applicable equipment would also be deployed to Nome for usage as back-up in the event circumstances took an unexpected turn making the equipment needed.

With the removal of nearshore ice functioning as a barrier to the movement of oil toward shore, summer open water conditions would conceivably leave a portion of the Yukon Delta shoreline exposed to possible oil contamination. Trajectory analyses, however, indicate that the remaining 1000-1500 barrels of oil would continue to move offshore. Open water and dispersant recovery techniques would continue until oil concentrations reach such low levels that response was no longer required. Based on reconnaissance flights at the time of an incident, trajectories would be plotted to be certain that no shoreline is about to become contaminated.

Logistics

All of the initial staging and equipment transport activities would be coordinated out of Nome. These activities would involve helicopter and fixed wing operations, transport of personnel and small vehicles (snow machines, tracked vehicles, sleds, etc.) out onto the ice, and possibly the deployment of ice breaking vessels and/or air cushion vehicles (2 to 4 man capacity type) to the spill cleanup site.

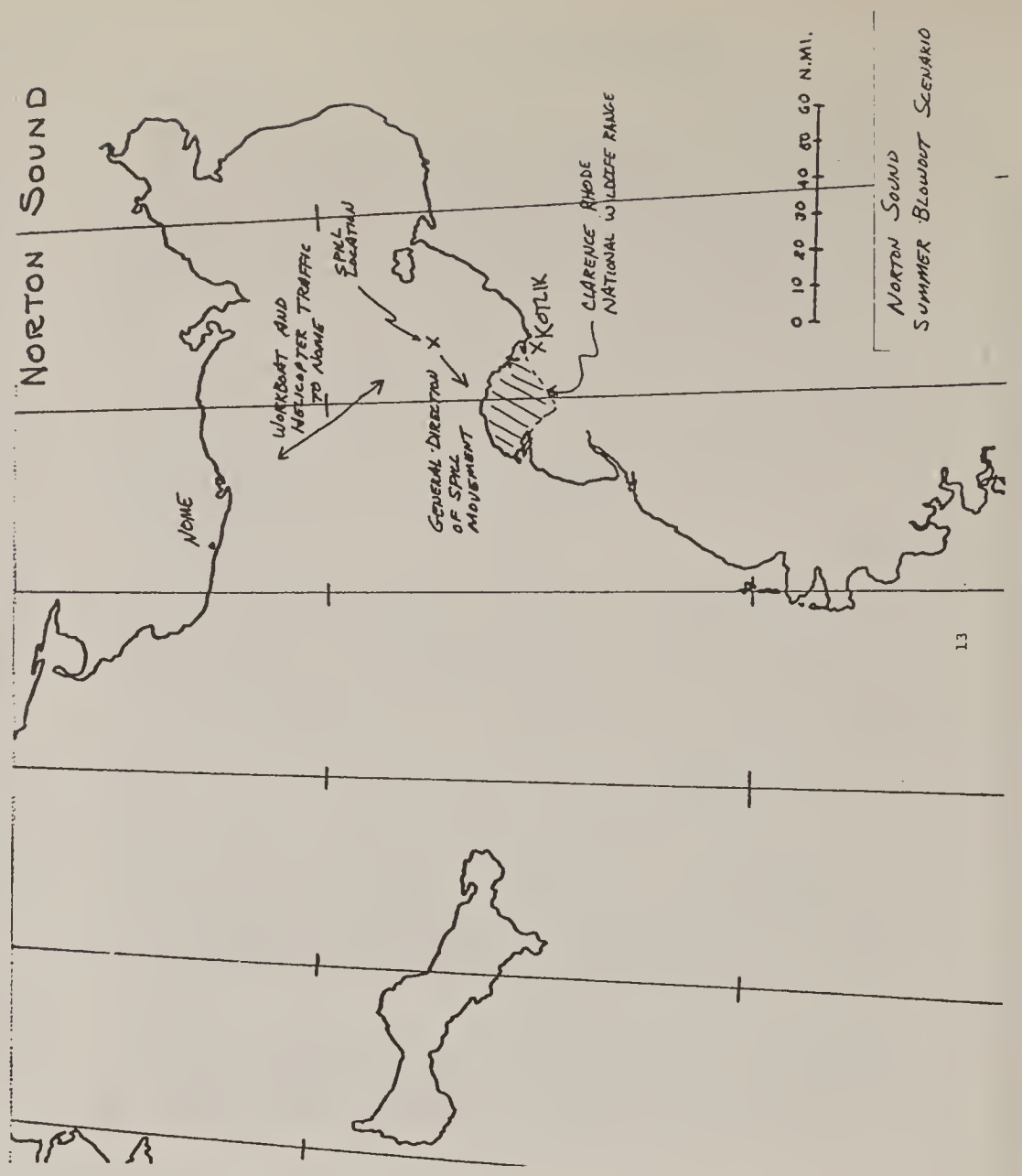
Depending on net ice movements and the success of oil recovery/dispersants/burning operations, additional staging areas might be established at or near the southern shoreline of Norton Sound. Existing airstrips, such as that at Kotlik might be utilized to support the cleanup program as the contaminated ice zone moves southwest out of Norton Sound.

Field crews at the outset would be housed at Nome and moved out on to the ice each day. Temporary shelters could be erected on the ice at several locations and a landing strip might be prepared (depending on ice conditions) to enable fixed wing support. It is expected that industry support helicopters in the area will have IFR capability.

Throughout the winter, spring, and summer cleanup operations, liaison would be maintained with RRT (Federal and State Regional Response Team) members and other regulatory/public interest groups. These efforts would be conducted to assure compliance with all regulations and to assess and document the full impact of the spill as well as the cleanup operations.

Resources

Although this oil spill scenario reflects a production phase in the Norton Sound, it is clear that ample human and hardware resources would be available out of Nome. The amounts and types of equipment required to respond to a spill of this nature are well within the present day capabilities. While some portions of the response would definitely be labor intensive, the successful implementation of response techniques described in this scenario could be achieved with personnel available to the industry now.



SHORELINE CLEANUP - YUKON DELTA

VI. Spill Description and Behavior

The spill scenario describes a blowout during mid-October under storm conditions in Norton Sound from a rig located in the southeast corner tract of the sale area. The storm out of the north pushes the slick toward shore in the Yukon Delta area in and around the Clarence Rhodes National Wildlife Refuge. 2500 barrels are available to impact the shoreline areas after a 20 mile journey across the waters of the Sound. With storm conditions, the oil is windrowed with the first oil impacting the shoreline within 24 hours. Due to the near freezing temperature of the water, the oil is thickened and the blowing wind has caused windrows with those oils at the edge of the slick (approximately 50%) quickly emulsifying in the high energy state of the waters from the storm.

Response

The immediate news of the blowout has triggered response to the rig by the attendant vessels and response crews in Nome. Notification of the spill was, of course, made to all Federal, State and local (including impacted village councils) agencies that require notification of an event of this type. In addition, the Calista Native Corporation and the Bering Straits Native Corporation was also informed. At the same time a small (2 person) reconnaissance crew with a portable command post and communications equipment are deployed to Kotlik. From trajectory analyses and real time observation by helicopter, it is known that the majority of the impact will be in the Delta area adjacent to Kotlik. However, the flow from the Yukon River and its distributaries creates eddies around the Delta area pushing the oil to the east of the Delta as well.

The first team at the village of Kotlik would set up a command post facility near the airstrip and make direct contact with the village council. The reconnaissance crew and a village representative (and an interpreter if necessary) would then start a shoreline reconnaissance as weather and the arrival of additional helicopter support arrives. Arrangements are made in Nome in the meantime to ship shoreline protection and response boxes to Kotlik and to provide additional response team callout for shoreline cleanup crews from Anchorage bases. Additional aircraft, air cushion vehicles (2 to 4 man carrying capacity type) river boats and fuel are relayed into Kotlik to support the pending shoreline cleanup tasks. Additional equipment of this nature and personnel can be supplied from Bethel and/or St. Marys depending on weather and logistics conditions in Nome.

Shoreline specialists (such as Dr. Ed Owens, Woodward-Clyde; Dr. Jan Cannon, University of Alaska; and Miles Hayes, Research Planning Institute) are put on call for technical assistance for potential cleanup tasks. As dictated by the reconnaissance

surveys, these people including the village representative may be employed to assist in the decision of when it will cause less damage to the environment to simply leave the oil as is. These decisions would be coordinated with the applicable Federal and State agencies (including the Regional Response Team).

Observations show that the oil and emulsions that have moved onshore have been incorporated into the tundra and some small onshore lakes and some of the sloughs and distributaries of the Yukon River. This development is a result of the 2.5 meter storm surge that developed in the 31 kt wind storm that was in progress at the time of the oil spill occurrence at the drilling rig. The early freeze-up conditions create a delicate tundra environment; however, due to the time of the year, the majority of the migratory birds have already left the area. The environmental conditions of freezing have helped to protect some of the tundra areas being impacted with oil and emulsion due to the ice being formed in the tundra, and the crust formed by the blowing snow in the upper story of tundra growth. This partial ice cover protects some of the environment by not allowing full penetration of the oil into the tundra. The shoreline is a combination of high energy and low energy beaches.

The original quantity of 2,500 barrels of oil has inundated the beach with 500 barrels being spread and mixed along with the eroding tundra scarps, approximately 1,500 barrels of oil and the additional emusified oil has inundated the high energy beaches, river sloughs and mud flats adjacent to the Yukon Delta. An estimated 500 barrels is eddied into some of the quieter low energy beaches east of the Delta.

The shoreline response headquarters set up at the Kotlik airstrip are the operations base for the three response needs. Small crews using a combination of containment and mechanical recovery equipment (small booms, skimmers of proven Arctic design, pumps and sorbents) to recover and incinerate the oil stranded by the storm surge in the inland lakes and river sloughs. These crews are supported by river boats, helicopters, and small air cushion vehicles (2 to 4 man capacity) to minimize tundra damage (30% removal and disposal).

The reconnaissance in the area of the tundra scarps shows the majority of the oil has mixed with the soil and organic debris (peat) and less than 10% of the 500 barrels is available for mechanical recovery. The remainder of these oils along with the oil saturated peat are ignited with air deployable igniters, from surface ignition with portable propane burners or manually recovered and burned in small portable incinerators. This burning produces a final disposal of 30 to 40% with residues being removed to a central inland disposal location set-up permitted to be near the village of Kotlik for further incineration.

The third area, low energy beaches and oiled mud flats, require a combination of response techniques. Arrangements for utilization

of local personnel and their small boats provide additional equipment supplemented by response boats from the oil spill response organization stored at Nome, small three wheeled all terrain vehicles and shoreline protection/containment booms (Skimmex type) for using on mud flats in the tidal areas all together provide the basic response items. Oil is corraled inside the booms and is washed off the beaches utilizing small pumps for a low pressure wash. The water and ice on the mud allow the oil to be moved back into the water where it can be contained by booms (30%). Contained oil can either be mechanically removed and incinerated in portable incinerators on the beach or in areas not capable of supporting men and equipment may be burned in situ (40% recovery at 80% burn).

These three response reactions to the oil spill would be utilized immediately during and after the storm until freeze-up would allow no further recovery operations. The locations of the remaining oil would be marked by suitable markers so that during spring breakup helicopter and air cushion vehicles could be utilized to locate and burn in situ oil as it surfaced through ablation (and some brine channel migration in the nearshore areas). The very small areas could be incinerated with portable propane burners to remove all visible traces. These methods would burn or remove 60 to 80% of the remaining oil.

The remainder of the crude oil and emulsions left by the cleanup process would be mixed into the environment not allowing mechanical recovery or disposal and would be the only remaining oil. The majority of this oil would be on the tundra receiving the storm surge. These contaminated areas could be rehabilitated utilizing the addition of special fertilizer to the tundra to allow quicker assimilation of the oil by the natural system. These type recovery techniques have been successfully utilized in other regions.

OIL BALANCE

2500 Bbls

1) Tundra Scarps - 500 bbls

50 bbls mechanically recovered

135-180 bbls burned in situ with the oil contaminated peat (residue to disposal)

270 bbls mixed into organics.

2) Storm Surge - (Tundra, lakes and river distributaries) - 1500 bbls.

450 bbls mechanically removed

50 bbls additional evaporation

1000 bbls remaining

3) Low energy beaches and mud flats - 500 bbls

135 bbls mechanical recovery

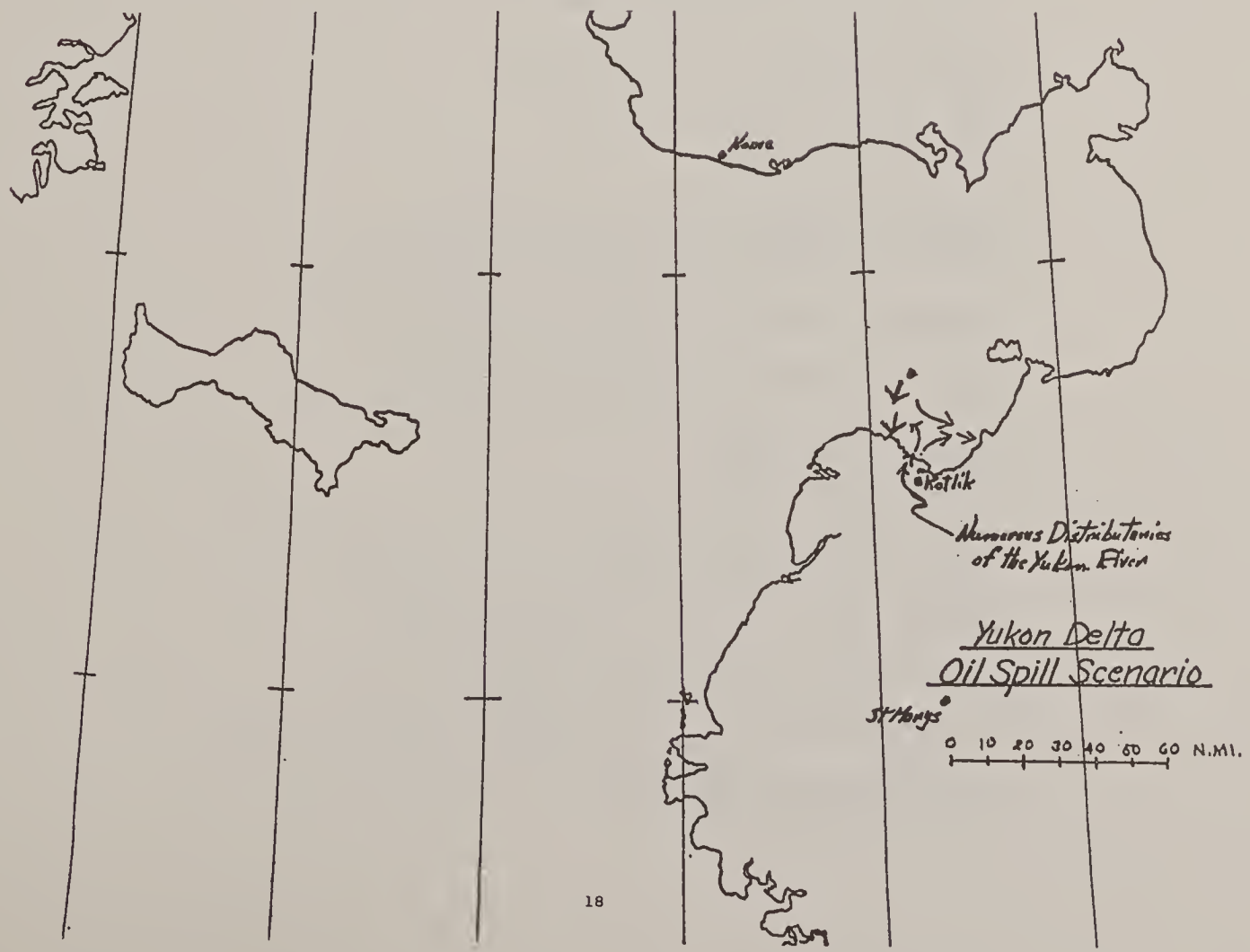
144 bbls In situ burn (with peat)

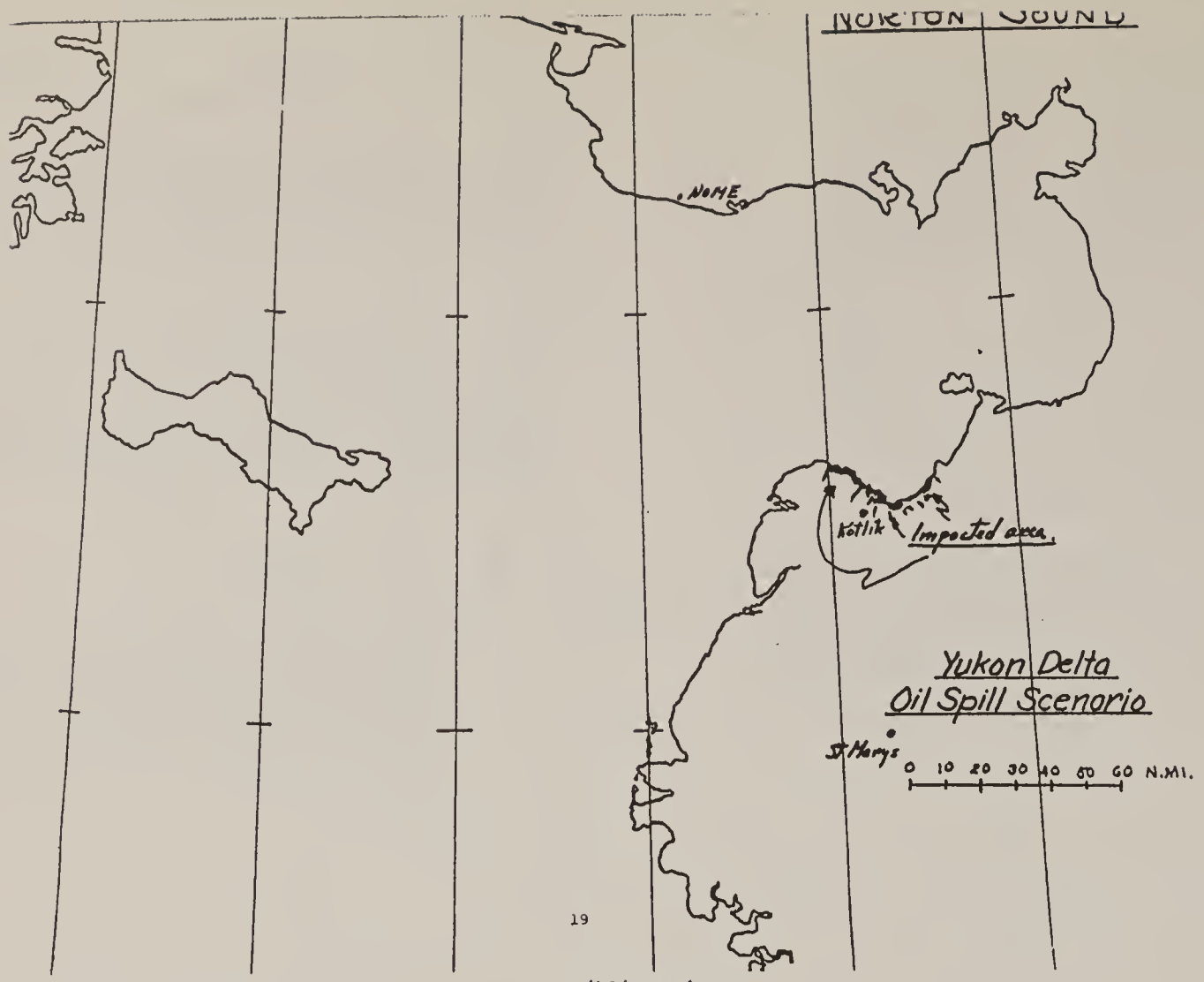
221 bbls remaining

4) Spring breakup - 1490 bbls

In situ burning of available oil at 60% efficiency removes 890 bbls with a remainder of 600 bbls in the environment unavailable for recovery.

5) 600 bbls of 10,000 bbls not recovered. Majority of this oil remains in the tundra and restoration efforts are utilized to enhance biodegradation.





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William F. Gusey Shell Oil Company Houston 1979

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APPENDIX L

COMMENTS RECEIVED FROM AGENCIES, ORGANIZATIONS, AND INDIVIDUALS REGARDING THE DEIS FOR PROPOSED SALE 57

Prepared by
The Alaska OCS Office

United States Department of Agriculture

Forest Service

Regional Office

P.O. Box 1628
Juneau, AK 99802

Reply to 1560

Date July 20, 1981

Mr. Ralph R. Emerson
P.O. Box 1159
Anchorage, AK 99510

Dear Mr. Emerson:

We have no information or comments that would further strengthen the OEIS on the Norton Sound Proposed OCS Sale 57.

Thank you for the opportunity to comment.

Michael A Barton
MICHAEL A. BARTON
Deputy Regional Forester

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
P.O. BOX 7002
ANCHORAGE, ALASKA 99510

REPLY TO ATTENTION OF

NPAEN-PL-EN

14 SEP 1981

Ms. Esther Wunnicke
Manager, Alaska Outer Continental
Shelf Office
Bureau of Land Management
P.O. Box 1159
Anchorage, Alaska 99510

Dear Ms. Wunnicke:

This is in reference to your Washington D.C. office's 19 May 1981 letter, 3315#57 (542), concerning the Draft Environmental Impact Statement (DEIS) for the proposed Outer Continental Shelf Oil and Gas Lease Sale, OCS Sale No. 57. We have reviewed the subject DEIS and offer the following comments for your use in preparation of the Final EIS.

The DEIS adequately address flood hazard problems, including coastal flooding and erosion for a programmatic EIS under the Council on Environmental Quality's tiering concept. However, induced or secondary impacts such as increased housing demand and support facilities in coastal communities may result in pressure for development in flood hazard areas. This should be recognized and addressed within the FEIS.

The DEIS cites associated activities involving dredging, filling, and construction within wetlands and navigable water of the United States; however, no general delination of impacts are presented. We realize that the OEIS is the first environmental document under the tiering concept approach for the proposed lease sale and resulting development, and detailed environmental documents would be prepared in the future. However, in preparation of the FEIS we suggest the following be included; "Evaluation of the discharge of dredged or fill material into waters of the United States will be included in follow-on environmental documents as required prior to any discharge. This study, in its current stage of development as a lease sale environmental evaluation, does not contain sufficient specification with regard to locations of disposal or fill sites to permit the required evaluations. Specific locations and evaluations would be developed and presented in an environmental document prior to construction or development."

NPAEN-PL-EN
Ms. Esther Wunnicke

14 SEP 1981

Thank-you for the opportunity to review the Draft EIS for the Norton Sound proposed Oil and Gas Lease Sale 57. If you have any questions regarding our comments, please contact Mr. Lloyd Fanter of my Environmental Resource Section at 752-2572.

Sincerely,

Harlan E. Moore
HARLAN E. MOORE
Chief, Engineering Division

CF: DAEN-CWP-V
BLM-Wash. D.C.

2

United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20241

IN REPLY REFER TO:

October 8, 1981

Memorandum

To: Manager, Alaska OCS Office, Bureau of Land Management, P.O. Box 1159, Anchorage, Alaska 99510

From: Director, Division of Mineral Land Assessment

Subject: Draft environmental statement, Proposed Outer Continental Shelf Oil and Gas Lease Sale No. 57, Norton Sound, Alaska

The treatment of mineral resources may be adequate for the purposes of this document. However, it should be emphasized at greater length that if oil-related development takes place the facilities developed for the oil industry will benefit the nonfuel minerals industry. Some specific comments follow:

Page 77 - Paragraph 3 and succeeding four paragraphs:

These paragraphs could be considerably expanded to more fully discuss the character, magnitude, and significance of the mineral resources of this region.

Page 83 - Paragraphs 2, 3, and 5:

These could also be elaborated upon, as above. Maps of geology, mineral occurrences and trends, known deposits, as well as information regarding past production and current activity may be in order here.

Page 121 - Paragraph 4 and succeeding paragraphs to the top of page 122:

This discussion applies equally to the Arctic Camp and other deposits in the Brooks Range schist belt and to the zinc-lead-silver deposits in the Red Dog-Wulik area and extending eastward.

The above mentioned changes and elaborations may not be considered essential for the purposes of this statement since interested readers can find the material in reports listed in the bibliography, particularly in "Mineral Terranes of Alaska," Arctic Environmental Information and Data Center (AEIDC), 1979. However, if the suggested changes are considered beneficial, the Bureau of Mines, Alaska Field Operations Center, can furnish maps, tables, and a draft of additions to the text.

In lieu of further elaboration, it may be more beneficial to reduce the size of this document. In common with most environmental impact statements, this document contains redundant statements and lengthy discussions, many well written and interesting, but not necessarily pertinent to the subject. Critical editing to produce a much shorter document more in line with its function as a decisionmaking tool is suggested. Again, the Bureau of Mines, Alaska Field Operations Center, will cooperate in any way possible on mineral-related matters.

Thank you for the opportunity to review this draft environmental statement.

James Paone

James Paone

UNITED STATES GOVERNMENT

memorandum

U. S. FISH AND WILDLIFE SERVICE

1011 E. TUDOR RD
ANCHORAGE, ALASKA 99503
(907) 276-3800

TO: Director (AE) Attn: Ray Fritz

DATE: 14 [illegible]

FROM: Regional Director, Anchorage

SUBJECT: Comments on Bureau of Land Management Outer Continental Shelf (BLM/OCS) Draft Environmental Impact Statement (DEIS) for sale # 57, Norton Sound.

Attached for your approval are comments on the subject DEIS.

A draft copy of these proposed comments has been provided the Alaska BLM/OCS office.

Rick Boyle

Assistant Regional Director

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

DRAFT

14 OCT 1981

Director
Bureau of Land Management
Department of the Interior
Washington D.C.

The U.S. Fish and Wildlife Service (FWS) has reviewed the Draft Environmental Impact Statement (DEIS) for Outer Continental Shelf (OCS) Oil and Gas Lease Sale #57 - Norton Sound and has the following comments:

The atatement appears to be well prepared and reflects the continuing increase in quality over past efforts. Incorporation of colored graphics within the main text is a significant physical improvement.

When considering the highly speculative nature of describing a possible future for an evolving process which spans a period of 35 + yeara and has a subatantial probability of not occurring at all, difficulties srise in providing meaningful constructive criticism of efforts of those doing the speculating. Consequently, useful comments are restricted to correction of mistatements of fact and recommendations for actions which might provide some increased level of environmental protection across a wide array of futures. Thus, the FWS believes that thoae mitigating measures which are universally applicable to the activity, regardless nf its final configuration should be emphasized.

A specific potential mitigating measure identified in the DEIS which appears to fulfill this criteria is the proposed Orientation Program. FWS recommends this measure be retained as a lease stipulation. Similar stipulations have been implemented not only for the Trans Alaska Pipeline and Lower Cook Inlet OCS sale CI as indicated in the DEIS (p. 14), but also for the joint State/Federal Beaufort Sea sale. Such a stipulation was also applied as a condition of contract for OCS sales #55, #60 and RS-1.

The FWS, believes the Orientation Program to be one of the most useful mitigating meaaures appended to Alaskan lease sale contracts. Many other resource sgencies concur. Industry has been cooperative in developing the program along linea recommended by FWS and others, and has we believe, recognized benefits not only to the natural snd social environments, but to industry as well. The program could possibly be included in U.S Geological Survey regulations as a permit requirement for exploration and development plans, but until that ia done, the measure should continue to be a atandard stipulstion for all Alaskan oil and gas lease sales as well as any other large project utilizing imported labor.

DRAFT

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The proposed stipulation for Seasonal Protection of Marine Mammals (p. 16) and the proposed stipulation for protection of An Area of Special Concern (p. 17) appear similar. The thrust of each of these measures is to protect the environment from oil spills, primarily in open water. A spill generated from either a drilling upset or a storage mishap could have equally undesirable effects. FWS believes these two stipulations should be combined into a single measure addressing both seasonal drilling restrictions and prohibition of storage or loading of production on all tracts identified in the two proposed stipulations. FWS also recommends that such a combined stipulation include language defining "storage" and contain provisions for relaxing requirements of the stipulation as new information and technologies become available which reduce probabilities of detrimental spills.

FWS suggests that informational material to be included in two of the proposed Notice to Lessees (Information on Iditarod National Historic Trail and Information on Subsistance Activities, p. 19) might be more effectively transferred by specific inclusion in the Orientation Program. The Service believes that this strategy would result in a greater number of industry employees being exposed to the issues than if the information was merely contained in a Notice to Lessee.

While overall quality of this DEIS displays improvement over previous efforts, some portions could stand additional upgrading. One section in particular, Impacts on Fish Resources (p.149), appears to need reworking. For instance, paragraph 3 under the sub-heading, Pacific Herring, states that, "should [an oil] spill target on the Norton Sound herring [during spawning], a year class could be severely reduced. The statement then goes on to say that such a reduction would be minute and that prorating the loss over the reproductive life of the year class would reault in a minuscule reduction. This statement appears tn be contradictory in that a severe reduction within a herring year class, especially a dominant year class, could produce aignificant declines in expected harvests over the course of the aeveral years that such a year class would normally provide substantial support for commercial or subsistance fisheries.

Table IV. B.2. b.-1 indicatea that Chum Salmon and Coho salmon eggs are "not present" yet states that "smothering and toxic effects to their eggs" is a potential impact. Sockeye salmon are not even listed in the table although they occur in the area.

The statement regarding "Unavoidable Adverse Effecta" to salmon (p. 152) should be reexamined. If chronic pollution sufficient to kill or deter salmon from entering certain streams persists for a period of five years, most if not all, of the aalmon species indigenous to those streams will be eliminated. With regard to pink salmon this could occur in only two years. Salmon runs so affected could only be reestablished through natural straying or by sufficient artificial reintroduction. Such a situation relative to Yukon River salmon stocks should probably receive broader discussion in the DEIS.

Lastly, it would be helpful for reviewers of the statement, if a section-subsection identifier could be printed at the top of each page.

DRAFT

DRAFT

The U.S. Fish and Wildlife Service appreciates the opportunity to provide comments on this draft document.

Sincerely,

Regional Director

DRAFT

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

OCT 13 1981

Memorandum

To: Manager, Alaska OCS Office, Bureau of Land Management
Anchorage, Alaska

From: Acting Assistant Director for Resource Programs

Subject: Review of draft environmental statement for Outer Continental Shelf oil and gas lease sale No. 57, Norton Sound, Alaska

We have reviewed the subject statement as requested in a memorandum of May 19 from the Director, Bureau of Land Management.

General Comment

We suggest that the final statement should consider the potential for impacts of oil spills on unconfined aquifers of the coastal areas, particularly on ground water in the alluvium and glacial outwash of the lower reaches of rivers.

Specific Comments

Page xi, par. 2. The first line should read "The probable impacts are based in part on the assumption that the conditional mean ...." The paragraph should mention estimated resources or production of natural gas, as only oil resources have now been discussed.

Page xii, par. 3. The onshore development period is given as 1981-1991, although the lease sale is not scheduled until 1982. Realistically, substantial onshore development is unlikely to occur until 2 to 3 years after the lease sale.

Page 4, last par., line 4. It is unnecessary to include a reference to "the Application to Drill" in this discussion. An APD for each well must be approved separately from the exploration plan.

Page 5, part C. It would be appropriate to acknowledge here or elsewhere that the U.S. Geological Survey is currently developing Alaska Region OCS Orders which will supersede the existing Arctic and Gulf of Alaska OCS Orders and will apply to drilling and production activities on all of the Alaska OCS, including the Norton Sound area.

Opposite page 7. It would be helpful to include the latest proposed 5-year leasing schedule as well as the current final schedule.

Table II.A.-1. Under the minimum case, the figure for gas should be changed from 0.9 billion cubic feet to 90 billion cubic feet.

Page 11, par. 1, lines 8-9. Should read, "Hydrocarbon resource estimates (conditional mean) for ..."

Page 11, last par., line 4. Change 1986 to 1985.

Table II.B.1.a.-1. The column labeled "Shore Terminals" should read as shown in the following tabulation, and the column labeled "Rigs" should not show a total.

Sale Year	Shore Terminals
1	1
-	-
5	0.3
6	0.4
7	0.2
8	0.1

Page 13, Potential Mitigating Measures. We believe equal emphasis should be placed on the protection afforded these resources by implementing the numerous environmental laws and regulations already in effect. We believe that some of the listed potential mitigating measures duplicate the provisions of existing environmental laws and regulations and are, therefore, unnecessary.

Page 25, par. 7; page 27, par. 3; and page 28, par. 6. It is not statistically correct to subtract conditional mean estimates.

Table III.A.1.-1. This table should be moved to Section IV.A.7. because it describes the environmental constraints that may affect various types of oil and gas exploration, development, and production technologies.

Page 35, par. 3, last line. "Onshore facilities" is apparently intended to be "offshore facilities."

Page 55, par. 4, line 3. There appears to be an error in the liter/gallon conversion.

Page 84, Cultural Resources. The text should indicate to which, if any, of the proposed sale tracts the cultural resources stipulation may be applied, and should provide the rationale for proposing that the stipulation be applied to a particular tract.

Graphic No. 7, Cultural Resources. It would be helpful to show by crosses (x) the locations of shipwrecks, if their approximate locations are known.

Page 85, par. 2. No mention is made of specific shipwreck locations except for two which are described as being located "in St. Lawrence Bay" and "north of St. Lawrence Island." If the locations of all five of the wrecks mentioned are known, they should be included (a table would be useful). If the locations are not known, that fact should be mentioned.

Page 103, par. 7, line 4. Change "reserve" to "resource."

Page 186, par. 2. Delete the reference to "proposed sale 61 (Kodiak Shelf)" as it has been cancelled. Also, delete "proposed" from sale 53, as it has already occurred.

Eddie R. Wyatt

Eddie R. Wyatt

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Manager, Alaska DCS Office
Bureau of Land Management
P. D. Box 1159
Anchorage, Alaska 99510

Dear Sir:

This is in response to your request for comments on the Draft Environmental Impact Statement for a Proposed Outer Continental Shelf Oil and Gas Lease Sale No. 57.

We have reviewed the statement and determined that the proposed action has no significant radiological health and safety impact, nor will it adversely affect any activities subject to regulation by the Nuclear Regulatory Commission.

Since we made no substantive comments, you need not send us the Final Environmental Impact Statement.

Thank you for providing us with the opportunity to review this Draft Environmental Impact Statement.

Sincerely,

Daniel R. Muller

Daniel R. Muller, Assistant Director
for Environmental Technology
Division of Engineering

cc: Director (542)
Bureau of Land Management
Washington, DC 20240

OFFICE OF THE GOVERNOR

DIVISION OF POLICY DEVELOPMENT AND PLANNING

POUCH AD
JUNEAU, ALASKA 9981
PHONE 465 3573

October 2, 1981

Ms. Esther C. Wunnicke, Manager
Alaska DCS Office
East 620 10th Avenue
P.O. Box 1159
Anchorage, AK 99510

Subject: DRAFT EIS FOR NORTON SOUND OCS SALE 57
State I.D. No. AK81070102

Dear Ms. Wunnicke:

The State of Alaska appreciates the opportunity to comment on the Norton Sound Draft Environmental Impact Statement (EIS) for OCS Proposed Oil and Gas Lease Sale 57. As Governor Hammond reiterated most recently in his February 2, 1981 letter to Secretary Watt, the State supports the conduct of Sale 57, though we prefer that it occur in the latter portion of the 1980-85 schedule. The State has also stated that proper timing of Sale 57 is contingent upon satisfactory local coastal management planning, further progress in developing adequate technology and transportation infrastructure, and a sufficient environmental data base for design of appropriate regulatory mechanisms. The current five-year OCS leasing program calls for a Norton Sound Sale in September, 1982. The State proposes leasing of adjacent State waters (Sale No. 38) during the first quarter of 1983.

It is important that both of us work closely with local government to ensure adequate local readiness to handle impacts associated with proposed federal and State leasing in the Norton Sound region. Furthermore, the State and the Department of the Interior should coordinate our planning efforts for these two sales, wherever possible, to ensure consistent and appropriate regulatory mechanisms.

The Draft EIS has been reviewed by the Alaska Departments of Environmental Conservation, Fish and Game, and Natural Resources and the Office of Coastal Management. General comments on the Draft EIS are discussed below. In addition, specific comments on the text and graphics are enclosed in Appendix 1.

The Draft EIS is relatively complete in its coverage of available environmental information and its assessment of major potential impacts. We feel that the State can utilize the information within the Draft EIS in our future planning and analysis for the State's Norton Basin Sale.

Lease Sale Configuration

In response to the Call for Nominations in November 1979, the State recommended deletion of blocks within 12 miles of the shore of the Yukon River Delta. This recommendation was based on an evaluation of water quality considerations, sensitivity of the marine and estuarine environment in the area, the relative capabilities of oilspill containment and cleanup equipment to mitigate impacts of a major oiling of the delta, and the resource projections for tracts in the area as provided by USGS. Our position has not changed; the State continues to recommend the deletion of the few remaining blocks within 12 miles of the shore of the Yukon River Delta.

Mitigating Measures

The State believes that the potential measures outlined in the Draft EIS (pages 12-21), represent a good starting point for the mitigation of impacts associated with the oil and gas activities in Norton Sound. We advocate retaining the Protection of Cultural Resources and Orientation Program measures as stipulations in the Notice of Sale. Provided that orientation programs sensitive to the local environment and and social values were designed and conducted, this measure could, in fact, promote greater understanding and appreciation among industry personnel.

Transportation of Hydrocarbon Products - The State supports this potential mitigating measure and urges the BLM to include this in the Notice of Sale for Sale 57. Furthermore, the State requests that the following be incorporated into this measure:

> "Pipelines through blocks (these need to be identified by BLM) will be buried."

These blocks occur in the zone of high density of ice gouging, as depicted in Figure III A.I.-2 of the Draft EIS. In our response to the Call for Nominations, the State identified this zone of considerable ice gouging north of the Yukon River delta as an Area Meriting Special Attention. While gouging is generally in the 10-20 cm depth range, ice gouges to 1 meter depths have been observed. The State feels that a specific measure requiring burial of pipelines in this zone is warranted.

Seasonal Protection of Marine Mammals from Effects of Oilspills During Peak Migration Periods - The seasonal protection of marine mammals and other aquatic resources through time restrictions on exploratory drilling, testing, and other downhole exploratory activity has been consistently applied to arctic offshore areas for several years. The State feels continuation of this practice is warranted in Norton Sound. Furthermore, seasonal drilling restrictions should apply to all proposed blocks in the Norton Sound lease sale area. Current technologies for the recovery of oil under ice or in broken ice are either unavailable, inadequate, or untested except under simulated conditions. Therefore, the State believes that the potential for oil/ice contamination and widespread pollutant transport is significant for all proposed lease blocks.

A flexible precedent in the proposed beginning drilling date (June 1) and termination date (October 30) has been established in the Arctic when conditions have warranted an extension at little apparent hinderance to industry. The measure on page 16 of the Draft EIS provides this flexibility in meeting the environmental objective of the seasonal restriction while allowing for extensions where good cause is shown.

Area of Special Concern - The State feels that the suggested lease stipulation for protection in the Area of Special Concern (p.17) is only partially adequate to protect water quality and marine resources of the Yukon River Delta. The State continues to recommend deletion of the remaining blocks within 12 miles of the shore of the Yukon River Delta.

Although the intent appears to be to protect the Delta from potential oilspills, the measure fails to address the possibility of a well blowout, rig fire, or pipeline break which could result in oil pollution greatly exceeding that which might occur from storage or loading operations. In addition, the measure fails to acknowledge spills that might occur as various support vessels service drilling rigs adjacent to the Delta (i.e., collisions, leaking fuel tanks, etc.) This measure should be expanded to require extra precautions to prevent blowouts, rig fires, and pipeline breaks.

Furthermore, continuous disposal of produced waters in shallow blocks of less than 10 meters water depths within the Area of Special Concern, as allowed in the suggested stipulation, may present chronic aromatic hydrocarbon and heavy metal stresses on migrating, bottom dwelling, and feeding organisms in shallow waters.

Information to Lessees - The measures concerning ship and aircraft operations near wildlife concentrations (page 18) and subsistence activities (page 19) would be improved by the addition of information on the seasonality of wildlife concentrations and timing of subsistence harvests.

The Alaska Department of Fish and Game has recently completed a report entitled Recommendations for Minimizing the Impacts of Hydrocarbon Development on the Fish, Wildlife, and Aquatic Plant Resources of the Northern Bering Sea and Norton Sound. Portions of this document are enclosed for review as recommended mitigating measures of the Department (Appendix 2). A thorough review of this document should be conducted by the BLM/DCS staff, and pertinent information should be incorporated into the Final Environmental Impact Statement. Copies of this document can be obtained by contacting Mr. Lance Trasky of the Department of Fish and Game (344-0541).

Alaska Coastal Management Program

As you are aware, the State of Alaska believes that the Department of the Interior's Final Notice of Sale for an oil and gas lease sale must be consistent with the Alaska Coastal Management Program (ACMP). We will continue our dialogue with you regarding appropriate mitigating measures and stipulations on postsale operations. Our assessment of potential environmental impacts of an oil spill in the blocks we have identified for deletion will weigh heavily in our eventual determination of Sale No. 57's consistency with the ACMP.

One major element missing from the Draft EIS timeline on local coastal planning is the federal approval of the Coastal Management Programs (CMPs). The federal approval process can take from one month to at least one year, depending on the nature of a CMP. Prior to federal approval, the Office of Coastal Management uses State-approved local programs for guidance in making consistency determinations. CMPs do not, however, receive great weight for federal decisions until after federal approval. Nevertheless, specific State authorizations, such as 401 Water Quality Certifications, must be made consistent with State law, so OCS-related developments within the State's waters will be reviewed against State-approved CMPs.

Thank you for the opportunity to comment.

Sincerely,

James M. Souby
Director

Enclosures

cc (without enclosures):
Robert Burford, Director,
Bureau of Land Management
Joe Jones, Conservation Manager,
U.S. Geological Survey

Appendix I: Specific State comments on the Draft EIS for the Norton Sound OCS Sale 57 (attached to Mr. James M. Souby's October 2, 1981 letter to Ms. Esther C. Wunnicke).

Page xi: Golovin Bay has already been used to some extent as a harbor for support activities this past summer, according to some Nome residents. Potential future use of this bay should be discussed, consistent with the present knowledge of industry and the BLM.

Page xii, third paragraph: "...the proposed onshore development period (1981-1991)." It is doubtful that significant onshore development will precede the lease sale.

Page xii, third paragraph: All of the coastal communities adjacent to the proposed lease area are dependent to some extent on a variety of marine resources including, but not limited to, marine mammals. Any oilspill large enough to significantly impact the fish and wildlife resources of the area could potentially affect all coastal communities throughout Norton Sound, not just Gambell, Savoonga, and Diomede as indicated in the DEIS.

Page xii, fifth paragraph: "24 million waterfowl and sea birds," should read, "waterfowl and shorebirds."

Page xii-xiii. "If a large oilspill contaminated a large portion of the Yukon Delta intertidal area, significant regional impacts to waterfowl and shorebirds could occur." Because of the concentrations of waterfowl and shorebirds and their extensive migrations, the impacts of a large spill could be significant on a national or international scale, not merely regional.

Page xiii, first paragraph: The likelihood of an oilspill contaminating the Yukon Delta should be reported as percent probability as a function of a number of variables rather than simply stated as being "unlikely for the proposal." The vast majority of people will be reading the summary, and an objective and informative presentation of estimates is essential. A brief description of the influence of prevailing wind, river runoff, and episodic events on oilspill trajectories should be included.

Page xiii, second paragraph: The available information does not necessarily indicate that the coastal areas of Norton Sound are at a low level of risk to potential oilspills. The information presented on page 38 of the OEIS and in the OCSEAP Norton Sound Synthesis Report indicates that circulation patterns of Norton Sound are weakly cyclonic in nature. Thus, an oilspill occurring within the Sound could potentially be distributed along much of the coastal environment of Norton Sound. "Anuk Islands" should read "Punuk Islands." The last sentence is confusing and appears to refute the potential seriousness of an oilspill impacting migratory marine mammals if spills occurred during peak spring and fall migrations. The paragraph should conclude as follows:

"the relatively high probabilities...beluga whale are possible. Given the assumed rate of oilspills associated with the proposed sale area, however, substantial adverse effects on these migrating marine mammals are unlikely."

Page 17. Area of Special Concern: It should be noted that statements summarizing the Norton Sound Synthesis Meeting regarding the adequacy of cleanup technology for an oilspill reaching the Yukon River Delta are contradicted by the oilspill cleanup contingencies presented in Appendix K of the OEIS.

Page 18: The Information to Lesssees should also indicate that harassment of wildlife in or over adjacent State lands and waters is a violation of Alaska State laws.

Page 22, last paragraph: Refer to comment for page xii, third paragraph.

Page 23, third and fourth paragraphs: Refer to comments on pages xii and xiii.

Page 32, Ice Forces: Although the DEIS depicts an area of high density ice gouging in Figure III. A. 1.-2, there is no discussion of this hazard zone in the text. In response to the Call for Nominations, the State identified this zone of considerable ice gouging as an Area Meriting Special Attention. It should be adequately addressed in the FEIS.

Page 33, "Norton Sound Pack Ice: This zone of ice occurs primarily in the central region of Norton Sound and varies in thickness from 0.1 to 0.7 meters." This statement does not appear to be consistent with those conditions described on page 37 of the OEIS. Ice conditions on page 37 are described as being 0.7 to 1.2 meters thick with a maximum thickness of 2.0 meters. The BLM should review the sources and present a consistent description of the ice conditions in the FEIS.

Page 35, last paragraph: Ice formation is said to occur by November, with full coverage occurring by mid-December. However, on page 37 (second paragraph) the OEIS states that: "Ice will begin forming in Norton Sound sometime after mid-October with the Sound covered by mid-November." The BLM should review both of these statements for accuracy and present them in a consistent manner.

Page 37, fourth paragraph, last sentence: Though conditions do approximate water depths of 20 meters in central Norton Sound (particularly in the area of severe ice gouging), water depths of this magnitude are not found near the Yukon Delta itself. In order to be consistent, measurements in feet should also be converted to meters.

Page 38, third paragraph: "Approaching the Bering Strait, net transport rates increase to about 10 meters per second." The validity of this statement should be reviewed. It is quite likely that net transport rates in this area are about ten centimeters per second.

Page 39, f. Storm surges: It should be noted that the storm surge of November 1974 occurred with strong winds from the southeast.

Page 42, 2nd paragraph: "For example, oil development images of Eskimo roles are far more frequently portrayed on television." Something is missing in this sentence; "oil development images of Eskimo roles" does not make sense.

Page 50, Section d: "The majority of salmon are taken by gill or set net, with some gill netting also practiced." This statement appears to be redundant in regards to gillnetting. Most set nets in use in Alaskan waters are actually set gill nets. The set gill net is the only legal commercial salmon fishing gear in Norton Sound.

Table III. B. 4.-3, following page 52: Average % should be changed:

Listed:	Should be:
28.5	3.7
23	23.4
24.5	24.3
30	3.8
*	*
24	23.9
*	*

Page 59 C.1., third paragraph: Total Yukon River salmon harvests are considerably greater than those presented in the DEIS. Commercial catches of king and chum salmon taken from the Yukon River in 1980 totaled 152,900 and 1,358,300 respectively. Yukon River subsistence fishermen harvested over 33,000 kings and over 300,000 chum salmon during the same time period.

Figure III C.2.-4, following page 62: This figure should be modified to depict herring spawning within Imuruk Basin in addition to those areas already shown.

Page 64. Herring: Some herring do winter to the northwest of the Pribilof Islands; however, the importance of this area as a wintering range of Norton Sound herring stocks is not clear. Though a portion of the Norton Sound herring may winter in the mid-Bering Sea, it should be pointed out that herring wintering areas have also been identified within Norton Sound. Wintering of herring in Norton Sound is also discussed on page 149 of the OEIS.

Page 65, second paragraph: Since much of Norton Sound is less than 20 meters deep, it should be stated that nearly all of the Sound is utilized "extensively" by the various life history stages of king crab.

Page 69, first paragraph, first sentence: This sentence should be modified to reflect the importance of the area in winter to some birds.

Page 73, Terrestial mammals: The BLM has failed to recognize the significance of impacts on terrestial mammals resulting from shore-based, support and secondary activities. Shore-based activities may result in considerable increases in hunting pressure and displacement of animals resulting from expanded roads and other access systems. Decreases in abundance of marine species due to offshore development activities and/or pollution may also place greater subsistence pressure on the available terrestrial mammal resources.

Pages 84-85, Cultural Resources: The DEIS does not adequately address inventory responsibilities as reguired by CFR 8DD. 4. a. 2. Specifically BLM-DCS is reguired to address impacts on all eligible properties. The onshore impact zones identified in the DEIS have not been systematically surveyed for cultural resources, hence, BLM-OCS is not in compliance with federal statutes and regulations. Only field surveys and subseguent following of procedures can adeguately address the problem.

Pages 87-88, Surface Transportation: The second sentence implies that either a second road to Solomon exists or the distance from Nome to Solomon is 7 miles. In fact, the Nome to Solomon road is maintained, during the winter, to a point approximately 7 miles from Nome.

Page 88-92, Alaska Coastal Management Program (ACMP): Many of the State comments deal with District Coastal Management (CMP) Program changes that have occurred since the DEIS was written.

Nome has completed a draft CMP, and it is currently under review. A public hearing is scheduled in mid October, and "concept approval" of the draft CMP is expected soon thereafter. The program will then be submitted to the Coastal Policy council for consideration. Once approved by the Council, the city has 90 days to adopt the plan by ordinance. (It is unclear whether this is what the DEIS meant by "demonstrate adeguate implementing ability.") The Nome CMP has now evolved to the point at which the draft includes draft goals and policies for energy facility siting:

Bering Straits Coastal Resource Service Area: The Bering Straits CRSA has recently received its first coastal management planning grant. The CRSA hopes to complete its plan within 2 years. Since Nome is surrounded by this CRSA, Nome's CMP contains specific regional recommendations which are forwarded to the CRSA since the two CMPs should be compatible. Nome does have coastal management jurisdiction over spillover effects since once the Nome plan is adopted as part of the ACMP, the Bering Straits CRSA plan will have to be consistent with the ACMP including Nome's CMP.

Bethel: Although not directly touching upon Norton Sound, the City of Bethel has commenced its CMP and expects to have a draft program ready by the summer of 1982. Bethel is the regional center for many of the southern villages that may be impacted by Norton Sound development.

Yukon-Kuskokwim Coastal Resource Service Area: The status of this CRSA, as described in the DEIS, is current.

One major element missing from the timeline (Figure III. E. 4.-1) is federal approval of the CMPs. Federal approval can take from one month to one year, depending on the nature of a particular CMP. Federal approval should be indicated on the timeline just after State review and approval. Prior to federal approval, the State can use State-approved CMPs for guidance in making consistency determinations, but local CMPs do not receive great weight for federal activities until after federal approval. However, specific State authorizations, such as 401 Water Quality certification, must be made consistent with State law, so OCS-related developments within the State's waters will be reviewed against State-approved CMPs.

Pages 105-114, Oilspill Risk Analysis: One of the most important features of the environment determining the area and extent of impact of oilspills is winds. No mention of wind statistics appears in the DEIS, except in the description of storm surges. This is a major omission because winds are the predominant factor dictating the distribution of ice and spilled oil.

The graphic results of the oilspill risk analysis illustrate anomalies which seem hard to understand (See pp. 108-11D.) Given the wide variations in the wind field, it is difficult to accept the alternating low risk and no risk segments of the Yukon Delta coastline. Furthermore, the tables of probability of impact in Appendix J of the DEIS imply negligible risk to Clarence Rhode Wildlife Refuge, yet a scenario in Appendix K is devoted to a 2,500 bbl spill impacting that area. It would be useful to describe wind statistics in a way that justifies a belief in low impact probability to the Yukon Delta.

Page 112, Oilspill Preparedness by OCS Lessees: "Generally, the operational capabilities of the containment booms found on board (based on manufacture type), function in waves up to 5 to 6 feet in winds of up to 20 to 25 knots. Oil skimming equipment of the type generally on board operates in waves up to 2 to 3 feet in height, whereas sorbent booms and pads are used only with contained spills." In view of the above statement, it is appropriate for the BLM to provide an assessment indicating the proportion of a year when environmental/oceanic conditions that would preclude effective cleanup operations prevail within and adjacent to the proposed lease area.

Page 12D, 5th and 6th paragraph and Page 121, 1st paragraph: It is the Division of Minerals and Energy Management, not the Department of Minerals and Energy Management.

Page 122, OCS Leasing in the Bering and Chukchi Seas: The Hope Basin, OCS Lease Sale #86, is described as being in the Bering Sea. This statement should be revised to reflect its true geographic location in the southeastern Chukchi Sea.

Table IV 8.I.c.-3, following page 132: King Salmon should also be included in this table as a biotic resource that is utilized by residents. Bowhead whales have been included here with a caption indicating that harvest pressure on this animal is "high" throughout their range. Harvest pressure on bowheads is only high near the coastal areas of their range, when their migratory routes bring them within close proximity to subsistence oriented communities. Harvest pressure in other portions of their range (i.e., mid-oceanic) is considered minimal.

Under sheefish harvest pressure the "low" designation is in error. This should be "moderate." Sheefish are an important subsistence item in the Yukon River. It is not important as a sport fish in the lower river, but is in all other areas of Alaska.

Also, the source of this table is identified as Ellanna (1980), yet none of the contained information was presented in that reference. Possibly the species list originated from the referenced source. The ratings appear to be very subjective, as the footnote indicates. The State does not agree with many of the oilspill and construction impact sensitivities presented and does not feel they represent reasonable extrapolations. In view of the acknowledged subjectivity, either detailed justifications for the ratings should be provided or the table should be omitted. For example, it is not clear if all life stages have been considered. Certain demersal fish have pelagic eggs or larvae that would be highly susceptible to spills at certain times of the year. Pelagic marine mammals should be more sensitive to oil spills in an OCS lease area than freshwater fish, yet bearded seal, spotted seal, ribbon seal, and polar bear received the same sensitivity rating as blackfish and northern pike. As presented, the table is inaccurate and misleading.

Page 133, King Crab Summer Target: Villages dependent on the Norton Sound commercial crab fishery would probably not include Unalakleet and Shaktoolik. However, residents of these villages do rely to some extent on subsistence crab harvests.

Page 137, Port of Nome Deepwater Terminal: According to the DEIS, temporary alteration of habitat is likely to occur in association with terminal construction. Actually, permanent rather than "temporary" alteration of habitat is likely to occur in the vicinity of the Nome deepwater terminal.

Page 146, third paragraph: There are actually two potentially significant activities to consider during dredging of artificial islands, both of which may be disruptive to local benthic fauna: dredging and the redeposition of fill material for the island, with their resultant sediment plumes. Both of these activities would adversely affect local benthic populations.

Page 148, second paragraph: the meeting of the oilspill contingency study group was cancelled, so this statement should be deleted from the FEIS.

Page 149, sixth paragraph: Populations of marine organisms in northern waters are often dominated by a small number of year classes relative to the number of mature age-groups present. The Norton Sound herring appear to be such a population. Although mature herring ages III through XV were captured in the Point Clarence area in July 1977, over 75 percent of these fish were age V (1972 year class). The loss of such a dominant year-class during the egg incubation or larval stage could have significant conseguences to future population size and harvests. Though the immediate reduction in total biomass due to the loss of eggs or larvae of a single year class may be minimal, it would be a major loss to the population when considering all potential growth and spawning years for that year class.

Pages 152-153: Much of this information about king crab is inferred from studies conducted elsewhere. Very little information is available concerning king crab life history within Norton Sound. To present the above information without a proper gualifying statement regarding the lack of knowledge on this topic is misleading. The BLM should modify the above statement to reflect the true nature of the data base. Furthermore, king crab eggs are not pelagic, the larvae do not remain pelagic for years, and crabs do not remain in the larval stages for years.

Pages 161, first paragraph: Seabirds also nest on Fairway Island in the Bering Straits region.

Pages 173-174. In the discussion regarding site-specific impacts on marine mammals it should be noted that ice breaking vessels and tankers may have a tendency to utilize and concentrate in leads and flaw systems that are critical to some species of marine mammals. Use and concentration of vessels within these areas during certain time periods (e.g., during spring bowhead migrations within major lead systems) may result in a greater degree of adverse interaction between vessels and marine mammals then may already have occurred in these areas.

Page 182, Site-Specific Impact Risk for Endangered Whales and the Peregrine Falcon: The BLM has referred to an important gray whale feeding area which may also serve "as a possible, although presently unimportant, bowhead migratory corridor." With the total world population of bowheads numbering about 2,300 individuals, all migratory corridors utilized by these animals should be considered important.

Page 230, 5th sentence: The statement regarding oilspill contamination of radiocarbon datable materials is unsupported in the text or by reference. This non-contamination stance should be more clearly explained. Decontamination may be possible, but it would increase process costs several magnitudes. That would place processing of such materials for dates beyond economic feasibility.

Pages 238-243, ACMP: Although a technical point only, the heading of the section on consistency should reference the ACMP, not the Alaska Coastal Zone Management program. Again, the district impacts for Nome can be updated since the draft CMP is available. The potential port development within Nome's city limits could be an area for major energy facility siting.

While this section describes a realistic assessment of the affected coastal management district's abilities to respond to the OCS "timetable" in terms of developed and developing coastal management it offers no format for these areas use if there were no coastal management program. Therefore, it may be useful to consider options for local input in the absence of CMPs.

Page 244, Impacts on Water Quality: The conclusion drawn in the discussion of the discharge of (a) drilling fluid and formation waters on water quality and (b) the adequacy of the NPDES permit program to accommodate these effluents should be factually supported to some degree in this DEIS, rather than simply referring to previous documents. While we generally agree that, for most tracts, depth and circulation are sufficient to render waste discharge concentrations non-toxic within a short distance of the platform this hypothesis may not withstand the test in very shallow, site specific areas of identified high suspended load and low amabient current velocity.

The EPA NPDES program will likely be issuing general permits for large areas of the OCS, following the Gulf of Mexico example. Permit conditions, while likely to acceptability limit "free oil" (oil and grease) in effluents, will not likely limit aromatic hydrocarbon levels. This oil fraction forms the basis of the State of Alaska's petroleum hydrocarbon standard, and mounting laboratory and field evidence points to its potentially toxic properties at low threshold concentrations. Only if this oil fraction is satisfactorily addressed by EPA will the State feel comfortable with the NPDES permit program as a totally acceptable process to protect water quality.

Appendix A identifies several blocks in water depths of approximately 10 meters (Blocks 486-546 in NP 3-2). Biological and sedimentological data from shallow Gulf of Mexico production areas support the hypothesis that absorption of hydrocarbons to suspended organics and settling of organic material to the bottom is resulting in an impoverished benthic community up to four hundred meters from the discharge point (Armstrong et al. 1979). Effects of these shallow water discharges on migration of pelagic species was not addressed in this study. These findings support a conservative approach to the disposal of formation waters in depths less than 10 meters and suggest direct over-the-side disposal with appropriate monitoring is acceptable in most blocks greater than 10 meters deep.

Bibliography. Various authors were referred to in the DEIS text, but were excluded from the bibliography. The following page provides a partial list of the authors cited, with corresponding page numbers indicating where they were mentioned in the DEIS.

Armstrong, H.W., K. Fucik, J.W. Anderson, and J.M. Neff. 1979. Effects of oilfield brine effluents on sediments and benthic organisms in Trinity Bay, Texas. Marine Environmental Research. Vol. II Applied Sciences Publishers, Ltd., England. Pages 55-69.

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Hughes, 1960	129
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Jones, 1976	129
Kawerak, Inc., 1979	52
Kramer and Wing, 1976	16B
Lanfear and Samuels, 1981	107
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Appendix K - Norton Sound Oilspill Scenarios -

Under Ice Oilspill Scenario: The statement that oil will retain an average thickness of one inch or greater while under ice is misleading. Dissimilar volumes of oil may become trapped or contained, dependent upon ice conditions and under-ice contours, water temperatures, under-ice currents, and sea state. Observations conducted at the Kurdistan oilspill (C-CORE, 1980) reveal a tendency of pack ice to reduce oil to small blobs and particles through processes of floe impact, and differential movement induced by swell propagation. This is also true of the statement which reads, "Since subsurface currents are assumed to be less than 0.5 nautical miles/day (1 cm/sec) the oil accumulation would not be displaced out of the natural pockets and other recesses of roughness that undersea ice is known to possess and would not be transported beyond its initial point of contact with the ice." Again, floe impact and swell induced movement can pump oil not only to the ice surface, but laterally along open lead systems. The underlying problem with both assumptions is that they assign discrete and stable characteristics to a phenomenon which, if it occurs, is likely to be extremely variable in its mode of behavior.

Proposed response techniques appear to be more applicable to shorefast ice conditions than moving pack ice. The On-Scene Coordinator's primary responsibility is to ensure the safety of cleanup personnel, therefore, it seems highly unlikely that surface crews would traverse the length of the pipeline route affected (which would be approximately 40 miles from shoreline to spill point), or that divers would be used to any great extent. The recovery techniques mentioned, such as drill holes and/or partial trenches, are dependent upon oil retaining its fluid characteristics; in cold water environments such as the northern Bering Sea, it is conceivable that crude oil released under ice would have the consistency of peanut butter after only a very short period of time. Besides being hazardous, such techniques are extremely labor intensive.

It is not reasonable to assume that in situ burning would recover 50% to 75% of the oil spilled. Most of the oil would be trapped beneath the ice and would be inaccessible to burning. Burning the small amount of oil that does reach the surface would restrict onsite activities and would increase the hazardous nature of such operations. Furthermore, oil to be burned must usually be continually reignited because cold temperatures and dilution by melting ice and seawater cause the burn to die out. Incendiary devices must then be repeatedly applied, compounding the existing hazards. The residues from burning oil or marginal film thicknesses can exceed 50 percent. This scenario describes burning and residue removal on rotting ice during the spring break-up period, but provides no insight into how such residues will be recovered.

Finally, operations described in this scenario rely on optimal weather conditions which may not always be present. Severe weather may preclude any type of cleanup response and should be accounted for in all oilspill contingency planning.

Late Summer Blowout Scenario: This scenario describes how the SDCK (Spilled Oil Containment Kit) skimmer can be transported easily by Hercules aircraft. The question arises - if a spill occurs off the Delta, where would such a plane land? The only airstrips that are large enough to accommodate such an aircraft are at Nome, Moses Point, and Unalakleet. If the SDCK is transported by marine vessel, the transit time involved, and the shallow water depths surrounding the Delta may prohibit its use of decrease its overall efficiency.

Chemical dispersants and their applications are treated in a casual manner not consistent with the issues involved in their use. One paragraph reads, "In the event sea conditions preclude mechanical recovery, permission is obtained to apply chemical dispersants using airplanes. The application is highly effective for dispersing the oil and eliminating the impact on the shoreline." If sea conditions preclude mechanical recovery, it is more than likely the oil will be dispersed naturally in the form of water-in-oil or oil-in-water emulsions. The application of chemical dispersants would then have very little additional benefit, and would only increase toxic values already present.

The greatest problem with this scenario is that it alludes to shoreline staging and cleanup operations on the Yukon Delta (see Shoreline Cleanup - Yukon Delta - VI). The scenario does not say how far the oil is spread inland from a 2.5 meter storm surge; however labor intensive mechanical removal operations would probably do more damage to the wet tundra surface than not doing anything at all.

Burning should be completely prohibited since it would result in direct destruction of the tundra surface without adequately accounting for the remaining oil residues. If oiled tundra areas are fertilized to enhance vegetation recovery, greater numbers of birds may subsequently be attracted to those areas than might normally occur, thereby exposing a wider range of individuals to the potential effects of residual and sediment-entrained oil fractions.

Comments on Specific DEIS Graphics

Several misspelled place names appear on the standard pull-out base maps which have been used to portray resource information. The following errors have been identified proceeded by their proper corrections:

Cape Deubigh (Cape Denbigh)
Grautley Harbor (Grantley Harbor)
Kitenpaluk (Kitnepaluk)
Pawooikiak Bay (Powooiliak Bay)
Penney Creek (Penny River) - locations is also incorrect
Puwowalak (Powooiliak)

Graphic No. 2a. Norton Bay is utilized as a belukha whale harvest area. This has not been designated on this map. Norton Bay has been shaded with solid green with no corresponding identification of solid green in the legend. This graphic also fails to differentiate between those areas that are utilized on a recurrent basis and those areas that are only used occasionally by subsistence marine mammal hunters. Bowhead whale harvest around the community of Wales is not shown on the graphic.

Graphic No. 2c. Several drainages located on the north side of Norton Bay should be included as subsistence fishing areas. Nearshore waters in the vicinity east of Nome should be identified as subsistence and commercial fishing areas rather than only a subsistence fishing area (Appendix A, Map B). The "commercial herring harvest area" of Golovin Bay has been depicted as occurring onshore. The legend has identified clam harvest areas with the following subtitle, "7 1/2-mile subsistence use area for crabs." The purpose and meaning of the subtitle is unclear. Further clarification or deletion of the caption may be required. The commercial king crab harvest area which has been depicted on this map only represents the most concentrated region of the king crab fishery. The legend should accurately reflect the nature of the portrayed information.

Graphic No. 3. "Know Occurence in Streams" should read, "Known Occurrence in Streams." The distribution of sheefish in the Koyuk River should extend out to the estuarine area. Sheefish should be shown as present on the entire lower Yukon River in all mouths, including the estuarine area.

Graphic No. 6A. Possible bowhead fall migration routes have been designated in the legend, but have not been identified on the map. Major gray whale feeding areas, as shown on the map, should be depicted with their feeding range extending farther north into the Chukchi Sea and farther west into the Chirikov Basin.

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF LABOR

OFFICE OF THE COMMISSIONER

P. O. BOX 1149
JUNEAU, ALASKA 99811
Phone: 465-2700

July 29, 1981

Raymond R. Emerson
P. O. Box 1159
Anchorage, AK 99510

Dear Mr. Emerson:

Thank you for the opportunity to review and comment on the United States Department of the Interior Draft Environmental Impact Statement of June 1981 of the Proposed Outer Continental Shelf Oil and Gas Lease Sale, Norton Sound.

After reviewing the Norton Sound Draft Environmental Impact Statement there are a few items relating to the socioeconomic impacts of the OCS development which should be clarified or updated.

Population for the City of Nome, as determined by the U.S. Bureau of Census, was 2301 in 1980 compared to the Alaska Department of Community and Regional Affairs revenue sharing figure of 2892. Revenue sharing figures for larger communities have tended to be high since it is in the communities' interest to have the highest population figure possible. Using the lower population figure would change the employment to population ratio used in the forecast analysis in tables such as IV.B.3.b-4. Assumptions and details of forecast methodology might better be included in the DEIS.

Commercial fishing permits as shown in Table III.B.4.-4 are not a particularly good measure of employment in the fishing industry. Alaska Department of Labor research into fish harvesting employment has found that fish ticket data shows actual participation based upon fish landings. In addition, a crew factor multiplier of 1.5 would provide the additional employment associated with the active permit user.

Per capita personal income data is now available through 1979 with revisions for earlier years. This could be incorporated into the DEIS. Table III.D.2.f.-1, which includes personal income data, should caution about the limitations of cost of living differential data at the census division level. Since the index, published in "Alaska Interregional Cost Differentials" produced by the Institute of Social and Economic Research in 1977, used a comparison of a fixed bundle of goods and services the data may be both dated and lacking in information about consumption patterns in rural Alaska.

Raymond R. Emerson
July 29, 1981
Page -2-

The importance of the subsistence lifestyle in this part of Alaska is described accurately in the DEIS. A study of the labor market of the Wade Hampton census division was recently completed by the Alaska Department of Labor. As the result of a survey of village residents, we found a large number engaged in subsistence activity and a large number interested in working. The unofficial unemployment rate approached 25 percent in that area during the survey period.

Overall the socioeconomic section of the DEIS appears to be a fairly detailed analysis of the current conditions and anticipated impacts of OCS development.

Sincerely,

Edmund N. Orbeck

Edmund N. Orbeck
Commissioner

07-G9LH

ALASKA OCS OFFICE

ALAKANUK NATIVE CORP.

P. O. BOX 89 - ALAKANUK, ALASKA 99554 - (907) 238 3117

DRAFT ENVIRONMENTAL IMPACT STATEMENT

(DEIS)

1)SUBSISTENCE-People harvest the fishes, sea mammals from along the coastlines and river sloughs. Only by means of livelyhood.
- A)Commerical Fishing
- B)Subsistence Fishing
- C)Sea Mammals
- D)Waterfowls

2)HEARINGS-Statements have been presented before by Native Organizations and comments from local peoples are not heard,except by alternatives which they represent for their village corporations.
- A)A.V.C.P.-Association of Village Council Presidents
- B)Nunam Kitlutsisti
- C)Calista Corporation
- D)Village Corporations
- E)Other Native Organizations

3)OIL SPILLS AND DAMAGES, ENDANGERMENT
- A)Sea mammals,fishes,waterfowls will be affected by oil spills
- B)Toxic wastes-poisons by dangerous chemicals
- C)Disturbance-noise from drilling oil,heavy equipments and large boats
- D)Walfare-walfare are decreased by Federal and State Government
- E)How will oil spills and damages be repaired?

4)RENEWABLE RESOURCES need to be protected, used extensively by local people. Futhermore developments needed in assisting local people develop the renewable resources.

5)NATIVE HIRE-Non existant
- A)No skills at present
- B)No funding available for training on oil and gas developments
- C)Promises are being broken to protect our culture
- D)How will local people survive?

6)Norton Sound area needs more studying, surveying. Characteristics are different in Norton Sound than in other areas of Alaska.
- A)Give local people, agencies and native organizations time to complete the plans and understanding of gas and oil develoment.
- B)Native Organizations need to notify the local residents of plans and developments.
- C)Local residents and native organizations need BENEFITS from Federal and State Government and oil companies for gas and oil development catastrophies.

7)Letter by Traditional Council of Alakanuk was sent to Governor Jay Hammond and other Federal and State Officials regarding gas and oil developments in the area of Norton Sound.

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TRADITIONAL COUNCIL FOR ALAKANUK
P.O. BOX 58
ALAKANUK, ALASKA 99554

September 2, 1981

Governor Jay S. Hammond
Pouch A
Juneau, Alaeka 99811

Your Honor the Governor:

The news of the State's decision to leaee the land around the entire Yukon Delta has just hit the village of Alakanuk

We will not attempt to hide the fact that we are EXTREMELY upset about this decision, especially eince there were letters sent to Juneau strongly stating the fact that we were definitely against this type of action.

We would like to know, are you and your officials unaware of the fact that there are several of us living in this area who are subsistent dwellers? Furthermore, are you aware of the fact that the area(s) marked for leasing are the same area(s) that we do most of our subsistent hunting and fishing in ?

Along with our subsisitent life goee our "commercial" hunting/fishing. Have you stopped to think of the way all of this oil and gas developement will affect the migrating of the smolts, and the immigrating of the adult fish? If the oil and gas were to take a negetive effect on the fish, then we would lose our food AND our income !

Either we the people have misunderetood, or the political figures have mislead us; but we have always been lead to believe that our Governors, Presidents, and various other elected officials of Country and State were there to help the people, NOT hurt them, and/or abuse them. We feel this very thing is happening to us right now by the officials of the "Great State of Alaska".

Perhaps you have information on this topic that has not yet been served us. Perhaps this information is supposed to give us an over-sight of the ways this oil and gae development would benefit the people. Whatever the case may be, we feel that you are willing to do this type of thing for the higher populsted areas of Alaska regardless of the fact that you will be destroying that which has been in our culture, tradition, and exsistence for so long.

We are eure that you are aware of the fact that the American Natives,(Indians), have been hurt MANY times by irrational decisions made by the various "elected" officials in the past. There are many marks in history that show the different ways the American Natives, (Indians), have been stolen from, lie to, and even killed in order to benefit the "White-Mans" society. We do not want this type of thing happening to the American/Alaskan Natives.

If you detect from this letter that we are HURT, and ANGERED beyond reason, then you have made the right detections.

It's one thing to be informed, asked, and finally overruled when it does not affect the lives of people; but it is another thing to go about doing things without first checking into it with the people it will cause the many dramatic changes to. To our knowledge, there has been absolutely NO State Officials in the villages around the Yukon Delta checking into these matters with the Yukon Delta people.

We want you to look at the Natives (Indians/Eskimos), side first, after all, WE are the ones who will have to live with the consequences of all this oil and gas developement, Even after it has left this area !!

In closing we might add this;
We hope that your "irrational" decision will not hurt the American/Alaskan Natives, (Indians/Eskimos), any more than they have already been hurt by the different governmental bodies.

Sincerely,

Elizabeth A. Chikigak

Elizabeth A. Chikigak, Vice-Pres.

Teri L. Curron

Teri L. Curron, Project Director

cc- A.V.C.P. (Association of Village Council Presidents)
Nunam Kitlutsisti
Alakanuk City Council
Emmonak Traditional Council
Kotlik Traditional Council
Anchorage Times
Tundra Drums
Tundra Times
The Washington Post
Congressman Don Young
Senator Ted Stevens
Senator Frank Murkowski
Senator Vern Hurlburt
President R. Reagan
Alakanuk Native Corp.

AVCP
Association of Village Council Presidents
P.O. Box 219 • Bethel, Alaska 99559 • Phone 543-3521

October 16, 1981

Ms. Esther Wunnicke
Manager
Alaska Outer Continental Shelf Office
Post Office Box 1159
Anchorage, Alaska 99510

Re: Comments on the Norton Sound Draft Environmental Impact Statement, OCS Proposed Oil and Gas Lease Sale 57.

Dear Esther:

Enclosed please find the comments from the Association of Village Council Presidents on the Norton Sound Draft Environmental Impact Statement, OCS Proposed Oil and Gas Lease Sale 57. Because our comments are rather lengthly we are attaching an index and list of enclosures in hopes of helping your office in reviewing the issues we raise.

Sincerely,

Harold Napoleon
President

Enclosures

COMMENTS OF

THE ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS

ON

THE NORTON SOUND DRAFT ENVIRONMENTAL IMPACT STATEMENT,

OCS PROPOSED OIL AND GAS LEASE SALE 57.

OCTOBER 16, 1981.

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20 Letter from Harold Napoleon to Bill Hopkins, July 13, 1981.

LIST OF ENCLOSURES

1: AVCP Resolution #80-03-03.

2: Testimony of Carl Jack, President, Association of Village Council Presidents, before the House Select Committee on Outer Continental Shelf, House of of Prepresentatives, April 15, 1980.

3 Memorandum of Agreement between the Kuskokwim Community College and AVCP for a regional government study.

4 Letter and Comments from G.D. Sharma to Ken Hamm about the Norton Sound DEIS.

5 Draft Norton Sound Synthesis Report

6 Letter from Robin D. Meunch to Ken Hamm about the Norton Sound DEIS

7 Analysis of Oceanic Circulation Portion of June 1981 Norton Sound Draft Environmental Impact Statement, by Robin D. Meunch and Lon E. Hachmeister

8 Letter to Frank Gregg from Frances A. Ulmer.

9 Memorandum from Richard Logan to Glenn Harrison

10 Map of federal upland oil and gas lands under consideration for leasing on ANILCA lands.

11 Map of the State of Alaska, Department of Natural Resources, Division of Minerals and Energy Management, Proposed Oil & Gas Lease Sale No. 38, Norton Basin.

12 Norton Basin, Proposed Sale No. 57, Relative Degree of Nomination Interest.

13 Letter and comments from W. E. Barber to Ken Hamm about the Norton Sound DEIS.

14 Letter/Comments from Donald W. Hood to Ken Hamm about the Norton Sound DEIS.

15 Comments from Dr. Bud Fay on the Norton Sound DEIS

16 Paper titled "The Other Village", by Harold Sparck

17 Paper titled "The Other Village Revisited", by Harold Sparck.

18 Paper titled "Directions of Growth: A Preliminary Report on the Development of a Planned Village Economy", by Harold Sparck

I. THE POSITION OF THE ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS ON THE NORTON SOUND OCS PROPOSED OIL AND GAS LEASE SALE 57.

Since March of 1980, the Association of Village Council Presidents (AVCP) has been requesting a five year delay in the Norton Sound proposed OCS lease sale. This position was first taken by the passage of AVCP Resolution #80-03-03, enclosed with these comments as Enclosure #1. This position is elaborated on in testimony presented by Carl Jack, the then President of AVCP, before the House Select Committee on Outer Continental Shelf, in Washington, D.C., on April 15, 1981. A copy of Mr. Jack's comments are enclosed as Enclosure #2.

AVCP has requested a five year delay based on the belief that within that time frame four events would occur which could mitigate the adverse impacts which Norton Sound OCS exploration and development might have on both the Norton Sound environment and the Norton Sound human population which lives in harmony with and depends upon that environment.

The first reason that AVCP has requested a five year delay is that the Norton Sound region has not yet been adequately studied by scientists. Numerous data gaps, discussed in detail in the next section of our comments, exist with respect to scientific knowledge about the biological and physical processes in Norton Sound. Additional studies are also needed on the Yukon Delta sociocultural systems. AVCP believes that, unless these studies are performed it is impossible to predict with any acceptable degree of scientific validity the possible adverse impacts which the region might feel from Norton Sound OCS activity.

The second reason that AVCP has requested a delay is to allow for the oil industry to develop drilling and oil storage and transportation technology which is suitable for the unique problems presented by the physical environment in Norton Sound. Furthermore, AVCP believes that a delay would allow the oil industry time to develop oil spill containment and cleanup technology suitable for Norton Sound conditions. A more detailed analysis of this point is discussed later in the section of our comments which critique the Norton Sound Oilspill Scenarios section of the DEIS.

The third reason that AVCP has requested a delay is to allow the villages time to prepare for eventual exploration and development of the region. An extension would allow the region to organize a regional government, such as a borough, to plan for development in terms of land use, housing, and support facilities. The Yukon-Kuskokwim delta region presently has no region-wide government which could perform these functions. AVCP has received funding from the State of Alaska, through Kuskokwim Community College, to

a study into whether it is feasable for the Yukon-Kuskokwim Delta villages to organize into a regional government. Enclosed as Exhibit # 3 is a copy of the Memorandum of Agreement between KCC and AVCP. This study should be completed in December, 1981. However, it may take several years to implement any recommendations made by the study. Two major problems might prevent rapid implementation of the study's recommendations. First, the study may recommend that legislation is needed, amending State law with respect to local government, so that the region can form a new type of regional government, not presently allowed under State law, which would be suitable to the needs of the region. Such legislation, if needed, would undoubtedly take a few years to secure. Second, it will take a few years to educate the 56 scattered villages in the region about the recommendations of the regional government study. Then it will be necessary to place the issue on the ballot for voter approval. Finally, we would estimate that even after voter approval it will take approximately one year for the new regional government to organize administratively. Consequently, we estimate that a five year delay in the lease sale would afford the region just enough time to organize its regional government.

Fourth, a five year delay would allow the Yukon-Kuskokwim Coastal Resource Service Area Board enough time to draft and have approved its coastal zone management plan for the Yukon-Kuskokwim Delta region. The earliest possible date for completion of this plan is during the spring of 1983. This assumes, however, that the plan is rapidly approved by the State's Coastal Policy Council--an assumption not necessarily supported by the experiences of plans submitted for approval from other areas of the State, such as the North Slope Borough. However, even it the coastal zone management plan were to be rapidly approved by the CPC, there presently exists no local mechanism of enforcement of this plan. Consequently, enforcement responsibility would fall back onto the State. AVCP believes it to be essential that, before oil and gas exploration and development occurs, a means of local enforcement be available. The formation of a regional government, discussed in the previous paragraph, would allow for local enforcement of the Yukon-Kuskokwim Delta Coastal Zone Management Plan.

The Association of Village Council Presidents does support our country's efforts to become independent from foreign oil. Consequently, AVCP has requested a five year delay in the Norton Sound lease sale rather than opposition to any development. AVCP seeks to ensure only that, when oil development does come to the region that such development can occur in a manner which does not recklessly endanger the Norton Sound environment and our villagers. We believe that a five year delay in the lease sale would allow for development to occur in a way that minimizes the potential for harm to the environment, maximizes local involvement in planning for this development, and in the process allows the nation to move toward energy self-sufficiency while ensuring the survival of our way of life.

II. THE DEIS FAILS TO DISCUSS BASIC BIOLOGICAL AND PHYSICAL PROCESSES WHICH OCCUR IN NORTON SOUND, FAILS TO UTILIZE NON-OCSEAP-FUNDED STUDIES RELEVANT TO THE NORTON SOUND REGION, AND IGNORES THE FINDINGS OF SOME OF THE OCSEAP STUDIES THEMSELVES.

As discussed in the previous section of our comments, AVCP believes that Norton Sound should not be leased until its biological and physical processes have been studied in greater detail. The DEIS displays the lack of scientific knowledge about some of the most basic biological and physical processes in Norton Sound. There appear to be three reasons why the DEIS is not an adequate decision-making document: 1. in many instances the biological and physical processes in Norton Sound have never been subject to scientific study; 2. in other cases, these processes have been studied by the private (non-OCSEAP) sector, but this information has not even been referenced in the DEIS; and 3. in some cases, the DEIS ignores the findings of some of OCSEAP's own reports, and also ignores the recommendations of the Norton Sound synthesis meeting held in Anchorage on October 28, 1980. What follows is a discussion of the various biological and physical processes which are inadequately covered by the DEIS for one or all of the three reasons listed above.

1. SEDIMENTATION. According to Dr. G.D. Sharma, Professor of Marine Science at the University of Alaska at Fairbanks, two major problems which could potentially pose a chronic pollution in Norton Sound have not been addressed: 1. adeherence of oil on sediments and sinking of oil by the sediments; and 2. fate of oil in contaminated sediments. See the letter from Dr. Sharma to Ken Hamm of Nunam Kitlutsisti, enclosed as Enclosure # 4. We incorporate Dr. Sharma's letter into our comments by reference.

In addition to the information included in Dr. Sharma's letter, Dr. Sharma has stated, during personal conversations with Ken Hamm in Fairbanks on September 15, 1981, that adherence of oil on sediments significantly changes the sediment flocculation characteristics, which subsequently results in changes in sediment migration patterns. Once the oil is carried by sediment to the bottom, in shallow high energy environments, i.e., Norton Sound, the oil impregnated sediments will be frequently resuspended by storms and, during each storm, some oil from impregnated sediments will be released into the water column. The DEIS totally ignores this process.

Dr. Sharma, during the 9/15/81 conversation, also identified numerous areas with respect to sedimentation that need additional study. Dr. Sharma stated that sediment dynamics have not been studied over a long enough period of time to understand them. No studies have been done on precisely how sediment flocculation patterns might change and how their migration characteristics might change if they were contaminated with hydrocarbons. No studies have been done on how contaminated sediments which have settled to the seabottom might be resuspended during periods of intense storm activity.

Dr. Sharma also stated that in 1971 he collected sediments in sea ice from Bristol Bay to St. Lawrence Island and Nome. This was a very limited study, according to Sharma, but the results indicated that during the fall severe storms resuspended bottom sediments which were then incorporated into sea ice. However, Sharma cautioned that sediments coated with hydrocarbons might behave differently, since no study has ever been done to see how much energy would be needed to resuspend sediments that have been contaminated.

Dr. Sharma also stated that he wrote a book on sedimentation processes in Norton Sound. Yet this book is not even mentioned or referenced in the DEIS.

Finally, Dr. Sharma stated that Norton Sound sediments are gas charged and unconsolidated, but no studies have ever looked at the thickness of the sedimentation layers throughout the Norton Sound seabottom, nor what the precise composition of those layers are. Consequently, the dangers posed by liquefaction are difficult to predict.

In summary, Dr. Sharma stated that the glaring holes in the DEIS from his point of view, was the lack of sedimentation studies, the lack of studies on sedimentation dynamics or interaction of sediments with hydrocarbons, and the lack of studies of effects of sediments on biological resources.

2. SUBARCTIC SEA BREEZE EFFECTS. BLM convened the Norton Sound Synthesis meeting in Anchorage, Alaska, on October 28, 1980. Enclosed as Enclosure # 5 is a draft synthesis report dated July 13, 1981. The participants in interdisciplinary session A, which concerned the impacts of potential OCS development on the Yukon Delta region, identified subarctic seabreezes as being a potential phenomena for transporting offshore oilspills to the Yukon delta region. According to page 18 of the draft:

> "Virtually every storm-free afternoon in the open water season, some sort of brisk onshore wind develops. This was identified as a probable major mechanism for moving an oil spill into the Yukon Delta. There are no systematic observations of this sort of local wind system, but reports from the Nome region suggest that the sea breeze can exceed 30 knots and extend at least 10 km offshore. A small program to verify the persistence, extent, and velocity of the sea breeze off the Yukon Delta would be very valuable in defining the desirability of a non-development buffer zone in the delta region. Observation programs should also operate one or more current meters to assess the importance and extent of nearshore tidal and wind driven currents."

Unfortunately, to date none of these programs have yet been carried out. Furthermore, the DEIS incorrectly states on page 198 that ". . . there are no major data gaps in the assessment information for the Yukon River Delta . . .." The DEIS ignores the recommendation and information which came out of BLM's own synthesis meeting.

3. ESTUARINE UPRIVER TRANSPORT. The Norton Sound synthesis meeting also identified another major data gap with respect to Yukon delta assessment information which could transport oil into the delta. Page 18-19 of the draft synthesis report states that:

> "In the special circumstances of the Yukon Delta region, the transport of oil far into the delta lowlands seems inevitable. Storm surges, sediment loading, and breakup flooding provide mechanisms for spreading pollutants far over the surface of the delta wetlands. A study of the estuarine hydrology of the Yukon distributaries would serve to define the seasonal importance of these phenomena both offshore and upstream, thus providing a firm basis for transportation routing or non-development buffering in the vicinity of the offshore stream channels."

Such a study has yet to be funded. Again, page 198 of the DEIS refuses to even recognize that this data gap exists, even though it was identified at the synthesis meeting called by BLM.

4. STORM SURGE FLOODING. According to page 19 of the Norton Sound Synthesis Report:

> "The erractic but fairly frequent flooding of the Yukon delta region by storm surges provides a mechanism for tremendous potential damage. By such flooding a spill could cover not merely the shoreline but the entire region. At present the phenonenon of storm surge flooding is poorly understood, but discussion during the interdisciplinary session . . .suggest that such events should be predictable from meteorologic observations. A conceptual model relating sea level fluctuation around the delta and Norton Sound to the movement of extratropical cyclones in the North Pacific and Bering Sea was suggested during discussion. The only data needed for such a model are meteorologic observations from the Navarin Basin sector of the Bering Sea . . .. It is recommended that these observations be collected, and that a predictive model for storm surges in the northeastern Bering Sea be developed. A warning system for oil development or transport activities based on this model could substantially reduce the likelihood of serious impacts from OCS development upon the Yukon Delta region."

Again, this recommendation has gone unheeded, yet page 198 of the DEIS fails to recognize this data gap.

5. OIL AND ICE. The draft synthesis report states on page that "(a)dditional transport-related research is needed to determine if oil travelling with ice in winter could reach the St. Lawrence area.

6. BIOLOGICAL OCEANOGRAPHY PRODUCTIVITY. Page 80 of the draft synthesis report identifies several data gaps with respect to biological oceanography productivity. Among the gaps which need to be filled are:

a. areas of phytoplankton productivity and the manner in which this productivity is distributed to food chains;

b. the identification of the major carbon inputs to the Norton Sound benthic system; and

c. information on the intertidal and shallow subtidal zone of Norton Sound.

7. BIOLOGICAL OCEANOGRAPHY--INVERTEBRATES. A study should be funded to determine why Norton Sound is important to so many species of benthic invertebrates, especially echinoderms. P. 80, draft Synthesis Report.

8. FISH--DEMERSEL. Little is known about demersel fish reproduction in Norton Sound. Nothing is known about the winter distribution of bottomfish. Little is known about the biology, spawning times, and distribution by season of Actic cod and saffron cod. Little is known about Pacific sandlance except that it is a preferred species for spotted seals and many seabird in Norton Sound during July and August. Nothing is known about what effect the incorporation of oil into sediments might have on predatory flatfish, such as starry flounder and yellowfin sole. Nothing is known about the distribution of larvae and young starry flounder. All of these data gaps are identified on page 80 of the Draft Synthesis Report.

9. FISH--PELAGIC. Little information is available on the life history of Norton Sound pelagic fish species. Spawning sites for capelin in Norton Sound need to be determined. Little is known about toothed smelt in Norton Sound. The degree of dependence on specific forage fish by other fish, birds, and mammals is not well understood. See pages 80-81 of the Draft Norton Sound Synthesis Report.

10. BIRDS. Insufficient information is available on the distribution and abundance of seabirds by season in the western part of the basin. Little information is available on the fall migration through the Norton Sound region. Distributional and seasonal data on waterfowl species are lacking, especially near St. Lawrence Island. Site intensive studies of feeding are needed at selected seabird colonies in the major oceanographic regimes to confirm what prey species are utilized by seabirds at different locations and in different seasons. See pages 82-83 of the Draft Norton Sound Synthesis Report.

11. MARINE MAMMALS. Insufficient information is available on the seasonal distributions and abundance of fin, minke, humpback, and killer whales, although it is known that these cetaceans migrate into and feed in the Norton Basin lease area during summer. See page 83 of the Draft Norton Sound Synthesis Report.

12. ICE FORCES. Additional information is needed regarding the velocity of ice movement, ice thickness distribution, and the movement of ice up onto shore. See page 98 of the Draft Synthesis Report.

13. FAULTING. Additional definition of the fault system(s) in Norton Sound is necessary, concentrating expecially on whether there has been recent movement along the faults. Page 99 of the Draft Synthesis Report.

14. SEISMICITY. Additional work is needed to define the magnitude and frequence of seismic events to adequately document the potential earthquake hazard in Norton Sound. See page 99 of the Draft Synthesis Report.

15. WIND AND WAVES. Adequate information is not yet available for Norton Sound to predict the various limits expected from these hazards. See page 100 of the Draft Synthesis Report.

16. BIOGENIC GAS. Additional data is needed to better define the depth and occurrence of gas-charge sediments. See page 100 of the Draft Synthesis Report.

17. SALMON. Shortly after the Yukon River breaks up in spring, salmon smolt leave the mouth of the river. However, noone knows anything about the distribution of salmon smolt in Norton Sound, or how long they remain in the region. (Personal communication between Dr. W. E. Barber, Assistant Professor of Fisheries, University of Alaska at Fairbanks, and Ken Hamm, Special Projects Coordinator of Nunam Kitlutsisti, in Fairbanks on September 15, 1981).

Numerous residents of Kotlik, Emmonak, Alakanuk, Sheldon's Point, St. Mary's, and Mountain Village testified in Emmonak on October 6, 1981, at hearing on the DEIS, about the critical importance which Yukon River salmon plays in the commercial and subsistence economies of the those villages. Damage to these stocks could render tremendous adverse impacts upon those villages. Studies about the location and timing of the occurence of salmon smolt in Norton Sound, as well as their food source(s), would appear necessary to protect the species from adverse impacts from oil development activities. Such information may display that additional stipulations should be attached to the lease sale to protect these species. Without this knowledge, exploration and/or development activities could inadvertantly cause substantial damage to these species.

According to Dr. Barber, we also do not know when or where salmon smolt feed when they leave the Yukon delta; consequently, we can not tell how an oil spill might affect their survivability.

18. LONG-TERM, INTERDISCIPLINARY STUDY INTO THE INTERRELATIONSHIP BETWEEN THE BIOLOGICAL AND PHYSICAL PROCESSES IN NORTON SOUND. The DEIS displays another lack of important data: the Norton Sound has never been subjected to long-term, interdisciplinary study of the inter-

relationship between the physical and biological processes found there. According to Dr. Howard Feder, Institute of Marine Science, University of Alaska at Fairbanks, the Norton Sound biological system is based upon sediment output from the Yukon River. Eastern Norton Sound is a sink where the sediment is deposited. Organisms residing there depend on this organic matter, and then larger animals feed on them. The Central part of Norton Sound is an area of more mixing with a redistribution of sediments, and contains a different group of animals that depend upon this mixing regime. The Western part of Norton Sound consists mainly of filter feeding benthic organisms. Norton Sound is a rather unique place with high productivity relative to other areas of the Northern Bering Sea, and is a function of the input from the Yukon and the deposition in that area . Unfortunately, little is known about the organisms living in Norton Sound except for where they are located; little is known about the food chains. (Personal conversation between Ken Hamm, special projects coordinator for Nunam Kitlutsisti, and Dr. Bud Faye, Institute of Marine Science, University of Alaska at Fairbanks, in Fairbanks on September 15, 1981, during which Dr. Faye read these remarks written by Dr. Feder).

Dr. Sharma says that Norton Sound water current studies have been of too short of a duration to be reliable, and that weather and water current studies have never been tied together. Dr. Sharma believes that the lack of studies over time is a "significant scientific concern." Personal conversation with Ken Hamm in Fairbanks on 9/15/81.

Dr. John Burns, employed by the Alaska Department of Fish and Game in Fairbanks, believes that the material in the DEIS is so general that it gives the proper impression, but doesn't show the important variations. (Personal conversation with Ken Hamm on 9/15/81).

Dr. Barber says that a model of how the Norton Sound system is working is needed, and that such a model requires much information from more than one specific area. For instance, Dr. Barber recommends that at least a two year long study be funded to understand the interrelationship between food organisms and fish. (Personal conversation with Ken Hamm on 9/15/81).

Dr. David Norton, employed at the Geophysical Institute, University of Alaska at Fairbanks, states that no ecosystem model has ever been funded for the Norton Sound area, although several have been proposed. According to Dr. Norton, one of these studies, had it been funded, would have focused on the zone between the eastern waters which are filled with Yukon nutrients and the western zone of colder, southward flowing waters. Dr. Norton was critical of the DEIS for not conveying a systematic, interdisciplinary understanding of what makes the system work. Dr. Norton stated that the DEIS draws no relationship between the physical properties of the area, such as sedimentation, and biological productivity, and that therefore the DEIS was poorly integrated. (Personal conversation with Ken Hamm on 9/15/81).

Dr. Bud Fay echoed Dr. Norton's concern that the

DEIS fails to look at the interaction of the Norton Sound system. (personal conversation with Ken Hamm on 9/15/81). (See also Enclosure # 15, page 1, par. 2).

Without a long-term, interdisciplinary model of how the Norton Sound system works, it is impossible to predict the adverse impacts which oil spills, noise pollution, water degradation, or habitat loss might have on fish and wildlife populations. AVCP believes that such a model should be made before leasing activities occur. (See Enclosure # 15, page 3, last paragraph).

19. WINDS. During the past several summers the Norton Sound region has been characterized by abnormal south winds, rather than the more normal north winds. (Personal communications between the villagers of Kotlik and Ken Hamm, October 2-4, 1981). However, scientific studies of the Norton Sound wind system have concentrated on those years of south winds. Consequently, we believe that the Norton Sound wind and current systems have not been studied over a long enough period of time for the results to be reliable and accurately reflect the normal yearly and seasonal variables. Consequenty, we believe that the oil spill trajectory studies may not be accurate predictors of the directions which oil spills might move. Dr. Sharma believes that the bottle release studies have been ambiguous so far, and have not supported any definite conclusions as to which way an oil spill might be carried. (Personal conversation between Dr. Sharma and Ken Hamm on September 15, 1981).

20. YUKON DELTA SOCIOCULTURAL STUDIES. When the DEIS was published the Yukon Delta Sociocultural system study by Dr. Robert Wolfe, Assistant Professor at the University of Southern California, was not completed. As a consequence, this important data was not included in the DEIS for public review and comment. Furthermore, Dr. Wolfe stated during his verbal testimony on the DEIS on Emmonak on October 6, 1981, that his study occurred in too short of a time (13 weeks) be be a useful predictor of the adverse impacts which oil and gas development in the Bering Sea might have on Yukon Delta villages. It is eesential that further study be done before the lease sale occurs.

21. OCEANIC CIRCULATION. A fine display of the DEIS's failure to use relevant materials obtained from Non-OCSEAP funded research as well as a failure to utlize the research obtained from OCSEAP's own programs is the section on oceanic circulation. According to Dr. Robin Muench, Senior Research Oceanographer at Science Applications, Inc.,

> " . . .the DEIS appears to have been preparcd with a degree of parochialism which is simply unprofessional. Not only has it used little of the pertinent, available information from other regions, it also ignores many of the

results of the OCSEAP-funded research within the Norton Sound region itself." See letter from Dr. Meunch to Ken Hamm, enclosed as Enclosure # 6.

A major problems with the DEIS, according to Dr. Meunch, is that the natural system in Norton Sound is highly variable in all respects, and variability takes time to understand. Unfortunately, the studies have been too short in duration and too limited in scope for a complete understanding. Thus, the DEIS gives the proper general impression but fails to describe the variables. According to Dr. Meunch, " . . . in this region the variations appear to be as important as the general impression, so we are left with a very limited fund of actual usable information." See page 1 of enclosure # 6.

Enclosed as Enclosure # 7 is Dr. Meunch's "Analysis of Oceanic Circulation Portion of June 1981 Norton Sound Draft Environmental Impact Statement (DEIS)," with supporting documentation. We hereby incorporate Dr. Meunch's analysis into our comments. Although for the sake of brevity we will not here attempt to summarize Dr. Meunch's analysis, suffice it to say that it points out numerous inaccuracies with repect to the DEIS's treatment of Norton Sound oceanic circulation, displays the failure to use OCSEAP-funded studies, and ignores the findings of other non-OCSEAP-funded studies.

CONCLUSION. The DEIS, as displayed, contains numerous and significant data gaps about the most important and fundamental biological and physical processes in Norton Sound. Part of the reason for this problem is the relatively small amount of scientific study which has occurred in the Norton Sound region. Another reason is the failure of the writer to examine releavant information outside of the OCSEA Program. A third reason is the failure of the writer, in some cases, to even utilize the findings of the OCSEA Program. The large number and serious nature of data gaps with respect to Norton Sound supports the AVCP position that a delay in Norton Sound leasing is the only logical alternative. As the Draft Norton Sound Synthesis Report states:

> The number and seriousness of the research gaps is not surprising when one compares the effort so far invested in the Norton Basin with that put into studies in the Beaufort Sea and southeastern Bering Sea. (See page 78 of Enclosure # 5).

AVCP could not agree more with this statement.

Given the concern about the lack of study in the Norton Sound region by members of the scientific community (see the section of our comments on information gaps), we are especially concerned about an apparent attempt, whether advertant or inadvertant, by the editor(s) of the synthesis report to make the report appear as if the Norton Sound System is understood. Although we realize that we are commenting here on the DEIS rather than the Synthesis Report, we do feel it necessary to bring up our concerns about the Synthesis Report at this time because the DEIS cites it with such frequency.

III. THE BUREAU OF LAND MANAGEMENT'S ALASKA OCS ENVIRONMENTAL STUDIES PROGRAM HAS FAILED TO GATHER SUFFICIENT DATA AND HAS FAILED TO PROPERLY USE THE SYNTHESIS PROCESS FOR NORTON SOUND.

Appendix 1 to the DEIS lists the studies funded by the Alaska Environmental Studies Program which are supposed to be relevant to the Norton Sound region. The reader is left with an impression that the Norton Sound region has been adequately studied by scientists. As displayed earlier in our comments, this has in fact not been the case. Numerous studies still need to be performed.

A second problem with the OCS studies program has been that, at least with respect to the Norton Sound region, the studies have been part of a crash program rather than part of long-term, interdisciplinary study. (Personal conversation between Ken Hamm and Dr. David Norton, Geophysical Institute, University of Alaska at Fairbanks). According to Dr. Norton, the BLM Ocs studies program for Norton Sound should have started years before it did so that the studies could account for yearly variables. Ideally, BLM would then call a Synthesis meeting, resulting in the publishing of a final Synthesis Report prior to the publication of the DEIS, since the purpose of the Synthesis meeting is to keep down the size and minimize the errors of omission and commission in the DEIS. Unfortunately, the Norton Sound Synthesis Report has still not been published in final form. In fact, the draft Synthesis Report was published on July 13, 1981, subsequent to the publishing of the DEIS in June of 1981. Nevertheless, the DEIS somehow refers the reader to the synthesis report for substantiating information. It is most unfortunate that the final synthesis report was not completed prior to the drafting of the DEIS. The DEIS should make no references to the Norton Sound Synthesis Repor' since it does not yet exist.

Furthermore, the input into the synthesis report has not gone well. For instance, W. Drurry was the Chairman of Interdisciplinary C of the Norton Sound Synthesis Meeting, (See page 22 of Enclosure # 5), and was responsible for drafting a major portion of the Synthesis Report. The draft which he wrote was approximately one-half the size of the entire draft synthesis report, yet his material covered only one-half of one of the three sections. Mr. Drurry has complained to the Editors of the synthesis report about this. According to Mr. Drurry's letter,

> "In general the version by its brevity gives the impression that knowledge of the environment of the Norton Basin is adequate and the impacts understood and controlled.
>
> Serious lack of work is referred to in the section on gaps in knowledge, yet this section by its brevity and generality gives the impression that these are the kinds of work that insatiable biologists would like to do . . .. I do not feel the degree of confidence that has been put into the synthesis report. For that reason I feel that you should be listed as the author and list my part as one of supplying material as the chairman of one of the sessions. I do not want to appear as the author if so much of what I think is important is left out."

IV. THE DEIS FAILS TO PROPERLY ANALYZE THE ALTERNATIVE ACTION PROPOSED BY AVCP.

The DEIS fails to discuss as an alternative to the proposal the position which has been advocated by AVCP during the past year and a half. As stated on page 1-2 of our comments, AVCP has been requesting a five year delay in the lease sale. Alternative III purports to analyze the potential adverse impacts which might occur if a three year delay were to occur. However, the impacts listed are essentially identical to the impacts expected from the proposal except that the impacts would be delayed for three years. AVCP disagrees. We believe that a delay in the lease sale will MINIMIZE, not simply delay, the adverse impacts of oil development in the Norton Sound region.

Pages 3-10 of our comments list the numerous data gaps which exist with respect to the Norton Sound ecosystem. If these data gaps were filled before the lease sale were held, we believe that this information would call for additional mitigating measures being attached to the lease sale. We assume that this would result in less adverse impacts to the Norton Sound region than which would occur if the porposal is adopted. Unfortunately, the DEIS fails to recognize even the existence of many of these data gaps, as previously discussed, and as a consequence fails to recognize that a delay until after these data gaps are filled would minimize the adverse impacts. Consequently, Alternative III needs to be totally rewritten so that a five year delay, rather than a three year delay, is analyzed, recognizing the present data gaps and analyzing the impacts which a sale might have if those data gaps are filled before leasing occurs.

Similarly, the DEIS fails to discuss the lessened adverse impacts which oil and gas development might have on the AVCP region if the Yukon-Kuskokwim Resource Service Area Board's Coastal Zone Management Plan is implemented before the sale; if the AVCP region organizes into a regional government before the sale; and the oil industry develops better exploration, development, oil spill containment and cleanup, and transportation technology before the sale.

The DEIS is extremely weak in examining the adverse impacts which might flow from a delay in the Norton Sound sale. This is a significant weakness in the document, as a delay in the sale is an alternative which seems to balance the need of the nation for energy resources yet takes into account local needs and concerns. A delay in the sale seems to be the only alternative which would be a proper balance between these concerns.

It is probably appropriate at this time, with respect to alternatives, to dispute the incorrect implications on pages 17 and H-7 of the DEIS that the scoping process in Alakanuk at the special AVCP convention led to the inclusion fo the southern block deletion alternative in the DEIS. In fact, the convention passed only one resolution with respect to alternatives, and that was for a five year delay. There was discussion about deletion of some southern tracts, but this discussion was initiated solely by BLM personnel. The DEIS should reflect this.

V. THE DEIS FAILS TO ADEQUATELY DISCUSS THE ISSUES RAISED BY THE PROPOSAL WITH RESPECT TO MIGRATORY BIRDS.

It is without question that the Yukon/Kuskokwim Delta, including the region at the mouth of the Yukon River is the most critical habitat for endemic waterfowl populations in Alaska (Tech. Paper #3, p. 5). The spring and summer home of more than 24,000,000 waterfowl and shorebirds, the area has not only been accorded the status of a National Wildlife Refuge dating from the 1950's , but is also nationally and internationally recognized for its importance in the nesting and feeding habitat in the wetlands of the Yukon River delta. Despite the dimensions of this natural resource, the Norton Sound oil lease sale is scheduled to include offshore areas within ten miles of the delta itself. The consequences of this action and the possible detrimental effects of the planned activity contained within the proposal, clearly place in jeopardy the waterfowl and shorebird resource. In fact, from the description contained in the draft EIS and Technical Paper #3, a proposal which has such potential adverse consequences is, if not folly, clearly very difficult to justify.

In many ways, the unique habitat of the Yukon River delta and the the magnitude of the waterfowl and shorebird resources are well-stated in the draft EIS and Technical Paper #3. The following is a list of references made concerning these important resources:

> "The Yukon River Delta is an important habitat for wildlife from all over the North American Continent. The delta is used by enormous numbers of shorebirds and waterfowl that migrate along the Pacific flyway, . . . The delta's extensive wetlands are the main habitat for 100 percent of the North Amercian populations of emperor goose, cackling Canada goose, and spectacled eider. Further, the delta has the largest concentration of nesting geese in North America." (Draft EIS, p. 59).

> "The importance, virtually on a global scale, of the delta's biological resources, and of the delta's subsistence economy. . . . " (Draft EIS, p. 145).

> "Around the edge of the delta are areas where tens of thousands of shorebirds and waterfowl seek food and shelter." (Draft EIS, p. 147).

> "Considering the great importance of the Bering Sea coastal habitat, particularly the Yukon-Kuskokwim Delta, to the highly sensitive species shown in Table 4 (Black brant, Emperor Goose, Steller's eider, King eider, Spectacled eider, White-Winged scoter, surf scoter and Black scoter) and its use by millions of other waterfowl and shorebirds, this region must represent the most important region in Alaska for these resources. . . Among the OCS planning areas,

> Norton Sound and the North Aleutian Shelf geographically pose the greatest concern to waterfowl resources in the Bering Sea region." (Technical Paper #3, p. 4).

> "However, the Bering Sea region especially the Yukon-Kuskokwim Delta, must be listed as the most important or most 'critical' from the perspective of endemic species, species diversity and productivity." (Technical Paper #3, p. 4).

As to the importance of this region for the waterfowl and shorebird resources, the draft EIS correctly points out the concerns that the Secretary must consider prior to the finalization of the proposed lease sale. Further, this is not simply an esoteric concern for the safety and survival of these resources. The Draft EIS, other comments contrived within this discussion and the comments on the effects upon the subsistence use of migratory waterfowl, confirm the practical reasons for the protection of these resources.

Contained within our comments on the assumptions which form the basis of the Draft EIS, we point out that based upon the tract nomination process, the proposed State of Alaska lease sale, and the comments of AOGA, the reliance upon low finds in the southern tracts and the discovery of gas rather than oil cannot be supported. In addition, the draft EIS assumes that any onshore support activity will occur in the Cape Nome area. Again, this assumption cannot be supported by the facts before us now. On page 10 of the draft EIS, the preparer issues a disclaimer as the assumptions which formed the basis of the document. Consequently, the conclusions which result from these assumptions, if the assumptions are invalid, are also invalid. Logically, it is then necessary to make new assumptions and apply the facts to them. The result being that all of the conclusions of environmental impacts upon the waterfowl and shorebird resources must be reanalyzed. For purposes of these comments, and without the means or ability to do the type of impact analysis which the BLM office is capable of doing, all references to low probabilities of adverse impact must be omitted and a discussion of the effects of development, were it to occur in the vicinity of the Yukon Dalta must be entered in its place.

> "Conclusion: If a major oil spill occurs, moderate to severe local impacts on seabird populations, perhaps 25 to 50 percent mortality, are likely to occur. If a large oilspill contaminates a large portion of the Yukon Delta intertidal area, significant regional impacts to waterfowl and shorebirds could occur. However, the oil spill risk analysis indicates the probability of this occuring is unlikely. The final oilspill probabilities indicate that significant regional impacts on birds are unlikely from the proposal." (Draft EIS, p. 160) (Emphasis added.)

This conclusion is inconsistent with the facts which are presently available to the general public, the BLM and the Secretary. Following a discussion of the possible impacts on the waterfowl and shorebirds of the Yukon Delta, a new conclusion will be offered in place of the one quoted above.

The Draft EIS considers two of the most important sources of adverse impacts upon the waterfowl and shorebirds: oil pollution and man-made disturbance, particularly noise. (Draft EIS, p. 156). Based upon research and experience from previous oilspills, the Draft EIS correctly states that the effects of oil pollution on birds is well documented. Id.

> "Birds - Oil pollution of any kind can cause the death of seabirds, shorebirds, and waterfowl by drowning, exposure, starvation, poisoning, and increased vulnerability to predators. The death of marine birds caused by oil slicks and the water soluble fraction of oils are generally one of the earliest and most obvious indications of an oil spill impacting our ecosystem. . . . Diving birds which spend the majority of their life at sea are most susceptible to contamination by oil pollution; however, any bird that feeds or settles on the sea is vulnerable.
>
> * * *
>
> "The direct effect of oil pollution on marine birds is well documented.
>
> * * *
>
> "In many cases, the damage inflicted upon a colony of birds exposed to oil contamination arises not out of the number killed initially, but rather to what degree the breeding populations has been effected.
>
> * * *
>
> "It has been observed that birds can contaminate eggs with oil adhering to their feathers or by utilizing nesting materials containing oils. Albers (1977) and Hortung (1965) have found that small quanitites of oil coated on mallard eggs significantly reduced their hatchability.
>
> * * *
>
> "The effects of oil ingestion are not as apparent or as observable as the effects of oil on eggs. Laboratory studies with herring gull chicks have shown that ingestion of small doses of crude oil interfered with physiological functions which, when combined with other normal stresses encountered by birds such as food shortages and sever storms, could threaten their survival. (Miller, et al., 1978).
>
> * * *
>
> Perhaps the greatest threat that oil pollution presents to individual birds is the danger of physical fouling or plummage contamination. Depending on termpature conditions as little as sever grams of oil on the plumage of marine birds may cause death (Nelson-Smith, 1973)."

> (Recommendations for Minimizing the Impacts of Hydrocarbon Development on the Fish, Wildlife, and Aquatic Plant Resources of the Northern Bering Sea and Norton Sound., pp. 173-178).

However, it is not simply that waterfowl and shorebirds are, in and of themselves, highly susceptible to the adverse impacts of oil spills. What is of significant additional importance is the type of environment in which the birds nest, feed and concentrate in the Yukon Delta. The report of the Habitat Division of the Alaska Department of Fish and Game, quoted at length above, rates the area as highly sensitive to oil pollution. Based upon the high oil retention of the shoreline, storm surges which can pollute large areas of the flat wetlands which comprise the major land form of the delta, the extensive entrainment zone, the intertidal habitat and the importance of this location to waterfowl and shorebird spring concentrations, waterfowl nesting, molting and major staging area, Emperor and snow geese molting and staging area, swan nesting and use areas, the Yukon Delta is not only the most critical habitat for waterfowl and shorebirds in Alaska, but is also extremely vulnerable itself. species such as Black brant and the Emperor Goose are among the most highly sensitive species which would be exposed to oil pollution in the Yukon Delta. Finally, the effects of oil pollution spreading over large areas of the delta as a result of storm surges and tidal transport, could last from 5 to 10 years (Draft EIS, p. 147). In summary the effects of an oil spill could very possibly be severe. If major oil activity were to take place in the southern regions of the proposed lease sale area, the conclusions drawn in the Draft EIS would be wrong.

The Draft EIS also considers the manmade disturbance from increased boat and air traffic and there effect of noise on waterfowl and shorebirds. Documentation of the impacts is presented. With the major interest in the lease sale area being in the southern section of the proposed tract selection area, it is likely that the amount of activity along the Yukon Delta will be increased. However, the conclusion statement contains no mention of the significant impacts which may occur. The only conclusions deal strictly with oil spills. The Draft EIS does suggest that air and boat traffic restrictuions would be mitigating measures to minimize these distrubances. Yet, it goes on to state that these measures are voluntary. With the likelihood of increased pressure in the Southern area, the ability to maintain voluntary compliance is lessened further. Consequently, the conclusion should include an indication of the impacts from noise and other disturbances.

In addition to the foregoing impacts on waterfowl and shorebirds, which were considered in the Draft EIS, the document failed to even discuss other conditions of oil development in the vicinity of the Yukon Delta. These activities include shoreline alteration, dredging filling and construction of gravel islands, site preparations, and sensitivity to drilling muds and cuttings. In light of the Draft EIS reliance upon the Habitat Division Study, cited above (See, Bibliography, p. 1), it is strange that none of these impacts were discussed. Again, this may have been the result of the basic assumption that most activity would take place in the

area in and around Cape Nome. However, this assumption cannot be used as a means of ignoring these other impacts on waterfowl and shorebirds in the Yukon Delta. Add to this the present likelihood of major activity in the southern tracts and the need for support facilities near these areas, and the result is further degradation of the habitat and adverse impacts on birds.

According to the Habitat Division study, the following impacts to waterfowl, shorebirds and their environment can result from the oil related activities listed above.

Shorebird alteration: Can destroy important nesting habitat in wetlands; can destroy natural shoreline; can disrupt flow of nutrients; can destroy adjacent coastal marshes.

Dredging, filling and construction of gravel islands: Can destroy waterfowl breeding grounds; can alter water quality; can modify salinity.

Site preparations: Can destroy habitat; can alter natural drainage; can cause permafrost degradation; and can cause water pollution.

Drilling muds and cuttings: Are acutely toxic and are more dangerous when there is little circulation and mixing as in shallow areas.

Each of these activities will impact waterfowl and shorebirds, and for that reason, the Habitat Division Study listed the Yukon Delta as highly sensitive to each one. The bases of these designations was made upon the effects of these oil related activities on those bird resources endemic to the Yukon Delta. The recommendation of Habitat Division in light of these conclusions is that these activities not be carried on in the vicinity or so as to have an impact upon the Yukon Dalta. As the Draft EIS does discuss neither these activities nor their impacts, again, the conclusions drawn on the impacts of the proposal on waterfowl and shorebirds is seriously deficient.

Inexplicably, the Draft EIS, while considering birds as a major resource of the study area, totally neglects U.S. responsibility under the magratory bird treaties with Canada, Mexico, Japan and Russia. While the former two treaties do not contain habitat provisions as do the latter two, all concern bird mortality and that has been the subject of implementing legislation in the form of the Migratory Bird Treaty Act, 16 U.S.C. 703 et seq.

Concentrating on the Convention between the United States of America and the Union of Soviet Socialist Republics Concerning the Conservation of Magratory Birds and Their Environment in the first instance. The U.S. has placed itself, vis-a-vis the Soviet Union, in the position of obligating itself:

> "to the extent possible, the Contracting Parties shall undertake measures necessary to protect and enhance the environment of magratory birds and to prevent and abate the pollution or detrimental alteration of that environment.

> "to the maximum extent possible in . . . eliminating such damage to migratory bird (substantial anticipated damage to significant numbers of magratory birds) and their environment and in providing for the rehabilitation of their habitat.
>
> "to the maximum extent possible, undertake measures necessary to protect the ecosystems in thos special areas described on list number I (areas deserving special attention) against pollution, detrimental alteration and other environmental degradation." (Treaty, pp. 3-4).

The Draft EIS is replete with instances where the expected impacts of oil development in Norton Sound will have exactly the opposite effects upon the environment of waterfowl and shorebird habitat than agreed to by the U.S. In addition, one of the areas which would undoubtedly have been included as a special area on list number I, would have been the Yukon Kuskokwim delta, including the area within the impact analysis of the proposed lease sale. However, final designation of these areas hav never been completed. (U.S. F.W.S., personal communication). Clearly, the United States has obligated itself in some way to follow the provisions of this treaty. The proposed action amounts to a unilateral repudiation of the treaty; and is not even considered in the document.

This treaty, as well as the other three treaties cited above, point out clearly the international significance of the waterfowl and shorebird resources of the Yukon Delta. Resources which, without question, are highly vulnerable to the impacts of oil development, especially during spring concentration and nesting, molting, and feeding, and fall staging periods during nearly six months of the prime exploration, development, and supply periods from May to October. Proceeding with the proposed lease sale under the present schedule, in light of the impacts predicted and the obligation to protect and enhance the environment of magratory waterfowl is astounding.

Mention was made above of the Magratory Bird Treaty Act's provisions which make it unlawful to kill any migratory bird, any part, nest or egg of any such bird. While this treaty is usually applied to the hunting of birds, at least one court has applied the concept of killing to the poisoning of birds through the placing of fertilizer on private land. In United States v. Corbin Farm Service, 444 F.Supp. 510 (E.D. Calif. 1978), aff'd 578 F.2d 259, the court found a possible violation of the Act where no hunting or intent to kill the birds was found. In the context of the Norton Sound lease sale, the killing of waterfowl and shorebirds, as a result of poisoning from oil pollution, drilling muds or other oil related activity could, by analogy, also be considered killing of magratory birds under the terms of the Statute. While it does not necessarily follow that oil industry officials or employees will be accused or convicted of violations of the Act, what this does point out is the important domestic and foreign policy established by the U.S. in regard to the bird resources. In light of this policy, the penultimate importance of the Yukon Delta and its

waterfowl and shorebird resources, as well as the vulnerability of this area to habitat degradation and direct bird mortality, the significance of the proposed lease sale becomes apparent.

In its discussion of the cumulative effects of the Norton Sound proposed lease sale, reference is made to the State of Alaska's sale # 38 proposed for the Yukon Delta. The State's proposed sale being within the intertidal habitat of the delta poses a significantly increased danger to the bird resources and cannot be lightly dismiessed. However, the lease sale has only been proposed at this time and based upon the State's insistance that no tracts be leased within 12 miles of the Yukon Delta, it is very unlikely that a lease sale will actually take place there. (See Enclosure # 8 and Enclosure # 9). Consequently, any justification for the federal sale based upon the possibly greater impact on the bird resources from the state's sale should be quickly disposed of.

In summary, the Yukon Delta's significance in regard to waterfowl and shorebirds is unmatched. The effects of an oil spill or other impacts from oil exploration and development are amply documented. Based upon the unlikely assumption that most activity will occur in the Northern tracts and that onshore facilities will be located at Cape Nome, the probabilities of the severe impacts actually occuring are rated as low. However, based upon the present state of knowledge, these assumptions are false. Consequently, the entire analysis is at best misleading. A new analysis based upon the assumption that development will occur in the areas near the Yukon Delta must be undertaken. When this happens, more likely conclusions can be drawn. It is probable that these conclusions will show serious and severe regional impacts upon the internationally important waterfowl and shorebird populations of the Yukon Delta and the significance of a decision to proceed with the lease sale as scheduled.

According to Dr. Bud Faye of the University of Alaska at Fairbanks, "(t)he nearness and potential vulnerability of a.) the world's largest waterfowl breeding and foraging area (Yukon Delta), b.) some of the world's largest seabird colonies, and c.) major migration routes of seabirds and waterfowl is a potential bomb of atomic proportions." (See Enclosure # 15, Page 2). (Emphasis supplied).

VI. THE DEIS DC A POOR JOB OF DISCUSSING ISHERY RESOURCES AND ANALYZING POSSIBLE ADVERSE EFFECTS ON THOSE RESOURCES.

Prior to discussing the impacts upon the fishery resources of Norton Sound, some corrections should be noted in the statement's description of these resources.

1. On page 61, the preparer writes that chum and pink salmon are the most numerous and of the greatest economic and subsistence value. However, Alaska Department of Fish and Game reports that the most important species is the king salmon. In 1981, the value of the king salmon which pass through the lease sale area was in excess of $5,000,000. The value of the total harvest is well in excess of $10,000,000 rather than the $5,000,000 for the 1978 season. The importance to attach to this sharp increase in just three years, during times when the prices received for the sale of salmon has not increased substantially, is that the abundance of the resource is definitely increasing. This increase has been a great financial boost to western Alaskan fishermen. It is these fishermen who have worked so hard to protect and conserve the fishery resources so that this increase could take place. Evidence of these efforts can be found in the citation to Napoleon v. Hodges on page 50 of the Draft EIS and Hanson v. Klutznick, (1980), not cited.

2. The description of the Lower Yukon commercial fishery is both out-of-date and erroneous. Statistics are available for 1980 and a portion of the 1981 season. Processing takes place both on floating processors and on shorebased facilities, such as in Mountain Village.

3. On page 80, the 1980 commercial salmon harvest was 445,600 in Norton Sound.

4. On page 149, it is stated that herring would be subject to oil development only during a short time of the year. Yet, the spawning, larvae and immature stages result in herring being inshore for nearly 6 months. That is a relatively long time, especially in relation to other migratory species.

The draft's discussion of the fishery resources is very cursory considering its importance to the local economy. Commercial fisheries provide the needed cash to enable the village residents in the Norton Sound and Yukon regions to provide for their families during the winter months. However, in a review of other d EIS's for important fishing regions (Sales 42, 62, 62A), the discussion in this statement is not out of the ordinary.

The basic failures of the discussion for the Norton Sound lease sale are the assumptions on the number and amount of oil spills and the timing of these spills. This has been adequately covered in the section on waterfowl and shorebirds.

The fishery resources presently important to the commercial fishermen are herring and salmon. The herring migrate through the area in the spring, spawn, and then migrate out to the Bering Sea (except for those that overwinter in Norton Sound) in the fall. Herring are exposed to impact during both migrations and during the spring spawning and rearing periods. The herring are most

susceptible during spawning on the Fucus kelp and eelgrass, but also as immatures during their fall migration through the lease sale area.

The draft EIS spends a great deal of time discussing the variability of herring (Page 149) and the natural mortality of herring roe (p. 149). The emphasis on these points totally misses the threat to the Norton Sound herring fishermen from an oil spill. First, herring are primarily dependent upon a strong age class for spawning and continued viability. If one year class is totally destroyed from an oil spill, the entire population may be severely impacted for many years. Also, nearly all herring migrate inshore in the spring. In contrast to salmon which stay on the high seas until maturity, almost all herring are subject to an oil spill during nearly six months of the year. Next, herring in Norton Sound spawn on kelp and eelgrass. An oil spill which contaminates the spawning substrate could adversly effect the potential for spawning for many years. Finally, juvenile herring, which would be more susceptible to oil spills than adult herring, have to migrate through the lease sale area during the fall. In summary, the herring resource of the Norton Sound is highly vulnerable to impacts from oil spills for a significant portion of their life cycle.

That most herring eggs do not survive to maturity indicates that there is a very small margin of error between failure and success for a year class. While gratification of this loss cannot be made, certainly a qualitative analysis is appropriate. This analysis would certainly indicate a greatly increased danger to herring from an oil spill or related oil development activity.

In addition to the possibility of an oil spill affecting the herring resource, other oil-related impacts were not discussed. Two major gaps involve the effect of drilling muds and cuttings and the possibility of a shore-based facility in the St. Michaels area. These two potential impacts are extremely important as drilling muds can be highly toxic, especially to herring in their developing stages. If on-shore development takes place in the southern region, it may very well be based in prime herring spawning areas. The cumulative effects on the herring resource in Norton Sound could be severe. And this is not for a resource whose harvest is expected to remain in the vicinity of 2,200 metric tons (p. 82), as the 1981 harvest was nearly 4,000 metric tons (ADF&G preliminary report).

The salmon resource in the Lease area is of unparalleled importance to local fishermen. The harvest in 1980 had a value of nearly $7,000,000 and currently the value is approaching $10,000,000 in 1981. With this tremendous income to the local area the critizisms which applied to the DEIS sections covering herring gain added importance when one considers salmon.

Salmon populations are exposed to impacts of oil development during two life cycle stages: as outmigrating smolts and inmigrating adults. The DEIS treats both stages superficially. The DEIS should analyze impacts rather than to say "a year class or more of immature fish -- could be adversly affected." Lets say one year class was affected;

what would be the long term affect? In subsequent years returners would be reduced in number, this could lead to other problems brought on by less than ideal weather patterns on any one of the many factors determining salmon survival to return in 5 years there may be no fishery. The lengthy period of time needed to rebuild a stock could lead to no fishery for years. Some further discussion is needed on every impact and their long term implications including a worst case analysis.

A discussion should be included on possible impacts on adult salmon. An oil spill could occur in a migration route causing a delay in adult migrations, delays of this type have been shown to cause considerable impacts on spawning success even if no actual physical damage from oil contact occurs.

Table IV B.2.b.-1 (p. 149) includes several good points under salmonid impact types but is not consistent in its presentation of these. Examples are the deletion of "probably interference with migration patterns" for chinook salmon and "reduced food supply" for coho, pink and chum salmon.

In conclusion the salmon resource in the Norton Basin area is much more important and delicate the the DEIS currently indicates to the reader. A more serious discussion of oil development-related impacts is in order with some in-depth analysis of long-term impacts on matters such as a reduction in one years run of salmon or long term impacts of drilling muds on smolt feeding habitat.

Additionally, there is almost no information in the DEIS about the importance of riverfish, such as whitefish, blackfish, and sheefish, which are important to the subsistence economies of Yukon delta villages. The importance of these species to the subsistence economy of the region is displayed in a draft "Yukon Delta Sociocultural Systems Study" prepared by Robert Wolfe, PH. D., for the Alaska OCS Socialcultural Studies Program, and dated September, 1981. Many of the spawning areas for these species are located in the river system near the coastline, and the potential adverse impacts which an oil spill might have on those species needs to be analyzed.

Finally, Dr. W.E. Barber, Assistant Professor of Fisheries and the University of Alaska at Fairbanks, states that there are three major weaknesses from his perspective:

> "1. There is a lack of exploration into potential impacts on fish and fisheries related organisms by development associated with exploration activities;
>
> 2. There is very little use of scientific and technical literature in examining potential impacts on the area; and
>
> 3. There is a lack of imagination in exploring plausible potential impacts and applying existing knowledge of how aquatic ecosystems function to the Norton Sound situation."

Enclosed as Enclosure # 13 is a copy of Dr. Barber's complete comments. We hereby incorporate them into our comments.

VII. THE DEIS FAILS TO ADDRESS CRITICAL ISSUES RAISED BY THE THE PASSAGE OF THE ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT OF 1980.

On December 2, 1980, Congress passed the Alaska National Interest Lands Conservation Act (ANILCA). Public Law 96-487. Section 303(7) of ANILCA created the Yukon Delta National Wildlife Refuge, including over thirteen million four hundred thousand acres of public lands in the Yukon-Kuskokwim Delta region. Included in the new Refuge is the old Clarence Rhodes Wildlife Refuge, including the Yukon Delta region. The DEIS's graphics still refer to the area as being the Clarence Rhodes Wildlife Refuge. This is incorrect, since the area is now part of the Yukon Delta Refuge.

The DEIS's failure to recognize this new designation by Congress is important for substantive reasons. According to Section 303(7)(B) of ANILCA:

> The purposes for which the Yukon Delta National Wildlife Refuge is established and shall be managed include--
>
> (i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, shorebirds, seabirds, whistling swans, emperor, white-fronted and Canada geese, black brant and other migratory birds, salmon, muskox, and marine mammals;
>
> (ii) to fulfull the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
>
> (iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (1) and (ii), the opportunity for continued subsistence uses by local residents; and
>
> (iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

None of these policies are discussed in the DEIS, even though an oil spill within the lease area could enter the Yukon Delta estuary system and land area, in the process violating all four of the purposes for which the Yukon Delta Refuge was created. An analysis is needed to explore the contradiction between the DEIS's recommended proposed course of act and the purposes for which Congress established the Yukon Delta National Wildlife Refuge. This analysis should pay particular attention to the fact that the Refuge was created by Congress after the Secretary of the Interior announced the five year OCS leasing schedule placing the Norton Sound area to be leased in 1982. It would seem that the DEIS, and the Secretary's final decision to lease, should take special note of the provisions in ANILCA concerning the Yukon Delta National Wildlife Refuge, since the leasing area is adjacent to the Refuge and leasing and the subsequent exploration and development activities in that region could have severe adverse impacts upon the Refuge.

Of particular interest is Section 303(7)(B)(ii) of ANILCA, providing that one of the purposes of the Yukon Delta Refuge is to fulfill the international treaty obligations of the United States with respect to fihs and wildlife and their habitats. As discussed in the pervious section on migratory waterfowl, the United States is a party to four different treaties with respect to migratory waterfowl. One of those treaties--with the Soviet Union -- requires the United States to protect the habitat of migratory waterfowl. Section 303(7)(B)(ii) of ANILCA seems to implement the Treaty with the Soviet Union with respect to the Yukon Delta Refuge, yet the DEIS fails to acknowledge this possibility. It appears that the proposal, which will degrade Yukon Delta waterfowl habitat, would therefore violate the Soveit Treaty as implemented by ANILCA.

VIII. THE GRAPHICS SHOWING LOCATION OF WILDLIFE, SUBSISTENCE ACTIVITIES, AND CIRCULATION ARE INCOMPLETE AND INACCURATE.

The graphics in the DEIS which purport to show the location of wildlife, subsistence activities, and circulation are incomplete and inaccurate. (Personal conversation between Ken Hamm and the elders of Kotlik, October 2-4, 1981). What follows are some of the numerous inaccuracies in the graphics:

GRAPHIC 2A: beluga whales are harvested all along the coast of the Yukon Delta.

-Seals are hunted farther offshore than indicated.

-Walrus are occasionally harvested along the coast of the Yukon Delta.

GRAPHIC 2B: -The subsistence harvest of moose occurs all along the coastal area around Kotlik on up past Stebbins, not just in the Pikmiktalik River as indicated.
-Similarly, grizzly bears are harvested throughout this entier area.
-The subsistence harvest of migratory waterfowl also occurs all along the coastline between Kotlik and Stebbins.

GRAPHIC 2C: -Clams are also harvested in the Kotlik Slough and the Pastolik River
-The subsistence harvest of fish and shellfish occurs in all the rivers and sloughs in the Yukon Delta area, and also extends out past the three mile offshore area.

GRAPHIC 3: -Sheefish are found in all sloughs and rivers from Sheldon's Point to Stuart Island (the graphic omits and locations for sheefish).
-Whitefish are found in all sloughs and rivers from Sheldon's Point to Stuart Island.
-Winter storm currents often move into Norton Sound and toward Unalakleet.
-The early spring pack ice drift normally drifts back and forth, North and South, with the tides. During periods of North winds, however, this ice moves onto shore at the Yukon Delta.
-The late spring pack ice drift also tends to move back and forth, north and south, with the tides.

GRAPHIC 4B: -Birds often migrate to the south over land.

GRAPHIC 5A: -Belugas sometime come into the mouths of the Rivers.
-Spotted seals haul out all around the mouth of the Yukon, especially in the fall.

GRAPHIC 5B: -Bearded seals come closer to shore in late spring than the graphic indicates.

GRAPHIC 5C: -In June and October walrus are sometimes found around the mouth of the Yukon River.

GRAPHIC 6A: -Gray whales are sometimes found off the Yukon delta in spring, summer, and fall.

Generally speaking, the Graphics all show one significant weakness: they show "average" conditions, but fail to display the yearly variations from this average. These yearly variations are important when considering what mitigating measures should be attached to the lease sales. Hence, additional study is needed into these yearly variations.

The comments above, displaying numerous inaccuracies in the Graphics, should not be considered an exhaustive list of all of the inaccuracies in those Graphics. The listing merely displays that even a quick presentation of the Graphics to the villagers who are familiar with the resources leads one to conclude that the Graphics are inaccurate. Consequently, the Graphics need substantial revising.

IX. THE ASSUMPTION THAT THERE IS NO OIL RESOURCE POTENTIAL WITHIN THE SOUTHERN BLOCKS OF THE PROPOSAL.

A basic assumption lies at the heart of the entire DESI: there is no oil resource potential within the southern blocks of the proposal (page 109 of the DEIS). However, the DEIS also states that "(i)f commercial quantities of oil are located in the southern deletion blocks, it would pose significant potential impacts to the Yukon Delta." (Page 109 of the DEIS). Moreover, the DEIS recognizes that "(e)stimates of resource potential are speculative, particularly in areas such as Norton Sound, where geologic information is limited and the presence of oil and gas has not been demonstrated." (Page 9 of the DEIS). Nevertheless, the DEIS fails to base any scenarios on an assumption that the southern tracts do, in fact, contain commercial quantities of oil. The assumption that the southern tracts do not contain commercial quantities of oil seems to rely upon Techincal Reports 49 and 1.

Tecnical Report # 49, titled "Bering-Norton Petroleum Scenarios, was completed in January, 1980, by Dames and Moore. The authors of this report, however, were well aware that it was based upon a lack of information, and as a result the report is laced with such qualifiers as:

" . . . the assumptions used to generate scenarios may be subject to revision as new data become available." (Page 1)

"In the course of this study, significant data gaps were revealed that imposed limitations on the scenario development and the related analyses listed above. These data gaps and related constraints should be kept in mind when considering the results of this study." (Page 5).

"The data gaps to a large extent result from the fact that industry and regulatory interest and research is only now beginning to focus on the Bering Sea basins and Norton Sound in particular." (Page 5).

" . . . the principal data gaps include: oceanography . . ., petroleums facility costs . . ., (and) petroleums geography--insufficient interest and research is only now beginning to focus on the Bering Sea basins and Norton Sound in particular." (Page 5).

"Field location in the scenarios is arbitrary but designed for impact assessment to provide a range of development cases that are shown to be economically and technically realistic options." (Page 9).

The report analyzes a high find scenario (see map on pages 114-15), a medium find scenario (see map on pages 140-41), and a low find scenario (map on pages 166-67). All of these scenarios assume that the oil deposits will be found in the northern part of the basin. However, a comparison of these maps with the actual tract selection in the federal sale

reveals that few, if any, of the deposits speculated by Dames and Moore are even in the area that will now be offered for sale. Consequently, the assumption of Dames and Moore as to where commercial quantities of oil will be found is inconsistent with the present expectations of the BLM/OCS office. Nevertheless, the DEIS follows the Dames and Moore assumption that the southern tracts will contain no commercial quantities of oil.

Technical paper # 1, titled "Resources, Developmental Time Frames, Infrastructure Assumptions, and Block Deletion Alternatives for Proposed Federal Lease Sales in the Bering Sea and Norton Sound", written by John Tremont, continues the basic assumptions made by the Dames and Moore Report. Technical Report # 1 was completed in April of 1981, yet seems to ignore the tracts which have been selected for leasing by the BLM/OCS office.

Attached as Enclosure # 12 is a copy of BLM/OCS's map of relative degree of nomination interest for the Norton Basin Sale No. 57. This map displays that the areas with the highest potential for oil and gas deposits, based upon the degree of nomination interest by the oil industry, lie toward the central and southern portion of the leasing area. Areas where the industry had a "high" degree of nomination interest lie within seven or eight miles from the Yukon Delta. Areas where the industry had a "medium" degree of interest extend right up to the State's tidelands aong the coast of the Yukon dleta area. On the other hand, the closest areas to the Nome area where the indsutry had a medium degree of interest are 8 or 9 miles from the coast, while the closest areas to the Nome area where the industry had a high degree of interest are located approximately 18 miles from the coastline. These areas of nomination interest imply that the oil industry, at least, is more interested in leases toward the central and southern portions of the leasing area.

During the summer of 1981 the State of Alaska announced its proposed lease sale area for Norton Basin Sale No. 38. See attachment # 11. The State had, during the spring of 1981, put out a call for nominations and request for public comment for the entire tideland area in the Norton Sound area. The only areas selected for further consideration, however, were those tracts located around the Yukon delta area and also along the eastern coastline fo Norton Sound. According to Jim Eason, employed by the Department of Natural Resources, Division of Mineral and Energy Management, the areas in the proposed sale area were selected because of industry interest. (Personal communication between Mr. Eason and Ken Hamm, Special Projects Coordinator for Nunam Kitlutsisti, September 30, 1981). The State's proposed lease area therefore also displays that the oil industry believes that the greatest potential for oil discoveries lies toward the southern (and, in this case, eastern) portions of the lease area, not the northern portion.

Thus, Technical Reports # 49 and # 1 are based upon assumptions which the federal and state call for nominations imply are erroneous. Industry interest seems to be centered more in the central and southern portions of the Norton Sound region than in the Northern portion. At best, the question as to the precise location of commercial quantities of oil in the Norton Sound region is debatable. Consequently, all scenarios in the DEIS which flow from this assumption must be questioned. The DEIS should have made one assumption that the commercial quantities would he found in the northern areas, and another assumption that the commercial quantities would be found in the southern areas, and then have analyzed various scenarios based on these different assumptions.

X. THE ASSUMPTION THAT SUPPLY, SUPPORT, AND STORAGE BASES WILL BE BUILT AROUND CAPE NOME FAILS TO CONSIDER THE POTENTIAL FOR OIL AND GAS LEASING ACTIVITY ON STATE TIDELANDS AT THE MOUTH OF THE YUKON RIVER, ON FEDERAL UPLANDS IN THE YUKON DELTA NATIONAL WILDLIFE RANGE, AND ON NATIVE CORPORATION LANDS IN THE YUKON DELTA AREA.

The DEIS assumes that under Alternatives I, IV, or VI, "crude oil and natural gas produced in the Norton Sound are expected to be transported via pipeline to an oil storage/gas liquefaction terminal located at Cape Nome." (DEIS, p. 10). The DEIS also states that "(t)he analysis of economic and population impacts is based on the assumption that about 90 per cent of all petroleum workers . . .would be housed in dormitories either offshore or at an enclave more than 10 miles from the present city limits of Nome." (DEIS, p. xi). The entire DEIS is base on the assumption that Nome will be the area hardest hit by impacts from oil and gas exploration and development in the Norton Sound region. This assumption seems to be based upon two more assumptions: (1) that the expected commercial quantities of oil deposits are located in the Northern potion of the leasing area; and (2) that the Cape Nome area has the best potential for being a base because of the water depth in the area relative to other areas of the Norton Sound Coastline. As displayed in the previous section of our comments, the first assumption may be false, as it appears to be based on USGS estimates which are outdated given the areas of industry interest. Consequently, this section will discuss only the second assumption.

On August 14, 1981, the AVCP Oil and Gas Task Force met with the Alaska Oil and Gas Association. Among those in attendance were Khoi Lee and Steve Lewis, employed by ARCO in their drilling operations department. Lee and Lewis stated that they would prefer to use the Cape Nome area for supply, support, and storage purposes because of the better potential for a port facility there as well as the relatively high degree of infrastructure already existing in Nome. However, they both cautioned that the eventual siting for these facilities is largely dependent upon three factors beyond the control of ARCO: the size of the find, the location of the find, and which bids from ARCO for leases are accepted. Thus, although the Cape Nome scenario might be preferable for logistical purposes, circumstances might dictate that another area be used.

The Dames and Moore Technical Report #49 supports the statements made by Lee and Lewis. While stating that the Cap Nome area would be a prime candidate for petroleum facilities bases, the report is quick to point out that "(i)t is probably reasonalbe to assume that if the economics are favorable most adverse siting conditions could be overcome." (Appendix D, page 1). Also, " . . . facility siting in many cases is a compormise between various technical criteria and environmental and socioeconomic suitability." (Appendix D, page 2). Also, "(t)he number and size of these facilties are dictated primarily by throughput capacity and discovery location." (Appendix D, page 7). Finally, the Appendix states that:

> Selection of these five sites has been made on the basis of limited oceanographic and coastal information; the Bering/Norton region is far removed from areas of active scientific and engineering study. The possiblity of significant petroleum finds could well prompt more environmental studies including port site evaluations that would more clearly define potential impacts." (Appendix D, page 16).

Appendix D also states that "(m)ost of the lease area close to the Yukon delta region can be eliminated (as suitable sites for the placement of onshore petroleum facilities) because of (the water depth) restriction." Page 4 of Appendix D. The use of the work "most" implies that there very well might be areas around the Yukon delta that are, in fact, suitable for the placement of onshore facilities, yet the report does not analyze where these areas are.

Even if one assumes that the DEIS's assumption that no commercial quantities of oil will be found in the southern tracts is correct, other potential oil and gas development activities occurring in the Yukon Delta area could result in all onshore supply, support, and storage bases being built in the Yukon delta region. The federal government, the state government, and a Native regional corporation are all considering allowing oil and gas development on their respective lands located in the Yukon delta area. Each will be separately discussed below.

The Department of the Interior, under Section 1008 of the Alaska National Interest Lands Conservation Act, in May and June of 1981, solicited from the public comments on a proposal to lease for oil development certain Federal lands in the State of Alaska. Included in the area being considered for leasing is the Yukon Delta National Wildlife Refuge, including federal lands in the Yukon delta area. See Enclosure # 10.

The State of Alaska's Department of Natural Resources, Division of Minerals and Energy Management, announced during the summer of 1981 a proposed oil and gas lease sale area for Norton Sound. Included within the proposed lease sale area are the tidelands from the shoreline to three miles offshore surrounding the Yukon Delta area. See Enclosure # 11.

Calista Corporation, a profit-making regional Native Corporation organized pursuant to the terms of the Alaska Native Claims Settlement Act, has entered into a contract for Milehigh, Inc., a subsidiary of AMOCO Oil Company, to do exploration, and perhaps subsequent development and production, of oil on Native Corporation lands around the mouth of the Yukon. Plans are underway to drill an exploratory well during the next year on Native Corporation lands. Emmonak Corporation, a village corporation organized under the Alaska Native Claims Settlement Act, has agreed to allow this exploratory work to occur on the lands to which it holds title to the surface estate (Calista Corporation holds title to the subsurface estate).

The DEIS further fails to examine the cumulative effects of the State proposal to study leasing activities in the mouth of the Yukon, in the face of the State's 1979 contentions that no leasing and exploration take place within twelve miles of the Yukon Delta shoreline. In the event of the a decision to lease by the State in January, 1983, then the Federal Government could in its subsequent Norton Basin Sale #88, tentatively scheduled for October , 1984, and in Norton Basin Sale #99, tentatively scheduled for October 1986, and using the Basin-wide leasing format currently advocated by the Secretary of Interior, it is very possible for the Federal OCS lands from 3 to 12 seaward of the Yukon Delta mouth could be bid on by Industry. In this case, the on-shore impacts currently pictured for Nome could very possible be relocated in the mouth of the Yukon, as Industries which currently plan to float in and out of Norton Basin's federal deep water leases would require shoreside facilities and support system for both off-shore and tidal lease tracts, and to economize, must station their manpower and support facilities in a location to supply both types of offshore drilling activity. All other impacts currently be impacted for Nome alone would then have to/transposed to the mouth of the Yukon. Under this case, the onshore impacts to the land, air, wildlife, and water quality of the refuge, and the sociocultural, subsistence, and economic conditions of the remote Alaskan Native villages on the Delta would require comprehensive treatment in the FEIS.

The last issue in this portion involves the current decision to preceed in State tideland leasing in areas adjacent to proposed Federal OCS leasing by Alaska State statute. The State of Alaska's 5 Year Leasing Plan follows the Federal planning document in areas and time of leasing interest under the "common pool" idea. In the event of a delay similar to Alternative III, or Alternative VI, the alternative being proposed by the Association of Village Council Presidents, the State of Alaska would in all probability delay its scheduled planning for Norton Sound Sale #38 until the Federal Government developed a new scheduled, allowing all the important issues being raised by AVCP as occuring from a Federal delay to take place in a timely and well-planned fashion without the urgent requirements of pending lease sales fueling the demand to get done in any way possible.

XI. THE OILSPILL TRAJECTORY ANALYSIS IS BASED UPON INFORMATION WHICH IS NOT RELEVANT TO THE NORTON SOUND REGION.

The oilspill trajectory analysis used in the DEIS (see page 158 and Appendix J) is based upon a Rand Corporation Model. (Personal conversations between Kenneth R. Hamm and Dr. Robin Meunch on September 24, 1981). According to Dr. Meunch, this numerical projectory model has been heavily criticized within the scientific community because it has never been adequately teseted or exposed to the scientific community. Dr. Meunch states that it has never been published in a scientific publication. Dr. Meunch is extremely critical of the model because it ignores circulation variances in Norton Sound. According to Dr. Meunch:

> "(The Rand Corporation Model) was satisfactorily tested in Bristol Bay and other places where the tidal currents are relatively large with respect to other water movements. In inner Bristol Bay, more than 90 percent of the current energy is tidal. Tides are, by their very nature, highly predictable. The combination of easily predicted tidal currents and established relationships between wind and surface (oil spill) trajectories or ice motions has led to good results in Bristol Bay. The Norton Sound regime is vastly different from that in Bristol Bay. It has smaller tidal currents relative to other currents. The tides north of St. Lawrence Island are so complex as to defy understanding, given the data presently available. It has high speed large-scale fluctuating currents which are apparently due to regional weather patterns. It has severe storm surges. It has far shallower water than Bristol Bay. At this time we cannot accurately predict instantaneous circulation in Norton Sound. I do not believe the Rand model will be reliable there other than for the trivial case of a specified wind and tidal current transporting a simulated spill." (See Enclosure # 6, page 2).

Furthermore, the draft Norton Sound Synthesis Report states that "(i)n the special circumstances of the Yukon Delta region, the transport of oil far into the delta lowlands seems inevitable." (Emphasis supplied). (See page 18 of Enclosure # 5). The conclusion of the DEIS on page 158 that "the intertidal habitat from the Clarence Rhode Wildlife Refuge to Kotlik . . . has a 7 percent conditional probablility of oilspill contact from a particular spill point . . . in the southeastern portion of the proposed sale area" is not supported by the Draft Synthesis Report.

Also, the few studies on Norton Sound circulation which have occurred to date have occurred during the late 1970's and early 1980's, a time of abnormally warm temperatures and southern winds. (Personal conversations between Ken Hamm and the villagers of Kotlik, October 2-4, 1981). How circulation patterns might change during years of more normal northerly windflow has yet to be studied.

Dr. Donald W. Hood, Oceanographic Consultant, is also critical of the Rand model. According to Dr. Hood,

> "(The oilspill trajectories simulations is) very difficult to evaluate since it depends on the three dimensional model run by the Ran Corporation working and the inputs to the model haveing a high degree of reliability. Unfortunately the input weather data for Norton Sound cannot be expected to be highly precise since only a few weather stations exist there.
>
> The model does not provide for storm surges which . . . must be the most important environmental factor for this area. What is the probability of an oil spill being carried over the Yukon Delta on a storm surge is a question that should be addressed?" (See Enclosure # 14, page 7).

In summary, the Oilspill trajectory analysis is based upon the Rand Corporation Model, a model which has serious flaws when applied to the Norton Sound region. We believe that the flaws in the model result in a underestimation of the chances that an oil spill occurring within the tentative tract selection areas would reach the Yukon Delta region. The model needs to be substantially reworked using the factors discussed above, such as reliable weather data, storm surge occurences, and the shallow bathymetry present in Norton Sound.

Taken together, these three plans for oil and gas development display that during the next few years the Yukon Delta region might be subjected to intense scrutiny by the oil industry. It is very possible that oil exploration and/or development might occur on lands in the Yukon delta which are immediately adjacent to the proposed federal OCS leasing area in Norton Sound. The Yukon Delta area is the only land area adjacent to the OCS leasing area where this type of intense onshore activity might occur. The only other land area near the federal OCS leasing area that might be leased for oil and gas development by either a private or a public entity is the State's proposal to lease the shoreline to three miles offshore tidelands on the eastern Norton Sound shoreline. See Enclosure # 11.

The DEIS fails to consider the cumulative impacts which these three onshore leasing plans in the Yukon Delta area might have on the siting of supply, support, and storage bases, as well as the siting of an enclave for oil industry employees. Should onshore oil and gas exploration and development occur in the Yukon delta region, it would be expected that supply, support, and storage bases would be located in that area. It would make poor logistic sense, given the poor weather conditions in Norton Sound which often makes airplane and helicopter flights impossible, to locate bases serving the Yukon Delta area in Nome. Also, it would make poor economic sense, given the distance from Nome to the Yukon Delta, to place these bases in Nome. Consequently, we would assume that these bases would be built somewhere in the Lower Yukon Area. If such were to occur, we believe that the federal offshore tracts in lease sale 57 would be serviced from these same bases. The oil industry will want to avoid unnecessary and costly duplication of facilities in the Norton Sound region.

The DEIS, however, makes no mention of any possible develpment activities occurring in the Yukon Delta area. This is a major problem with the document. The Yukon Delta region lacks the infrastructure which is present in Nome, and consequently the Nome development scenario discussed in the DEIS cannot simply be transferred to the Lower Yukon region. There exists no major town in the Lower Yukon region of the same magnitude as Nome, and therefore the Lower Yukon region is even less able than Nome to absorb the impacts which supply, support, and storage activity would bring. The DEIS needs to be rewritten to include a Lower Yukon River development scenario which, as accurately as possible, predicts the impacts which development in the Lower Yukon region might have. Given the tremendous importance of the area's fish and wildlife populations, coupled with the extreme vulnerability of the region to oil spills, and given the expected tension between the way of life presently followed by Lower Yukon residents, and the way of life which development would bring to the area, we would expect that such a scenario would display that the impacts would be very severe indeed.

XII. THE DEIS UNDERESTIMATES THE POTENTIAL SEVERE CONSEQUENCES WHICH A BLOWOUT COULD HAVE, AND IS OVERLY OPTIMISTIC ABOUT OIL SPILL CONTAINMENT AND CLEANUP IN THE NORTON SOUND REGION.

JACK-UP RIGS

It is generally agreed that exploration of the lease area will be carried out in Norton Sound by jack-up rigs (DEIS at 101). Because jack-up rigs are not ice resistant, exploration will most likely be confined to the open water season (roughly late May to late October)*. This presents a serious problem regarding relief well drilling in the event of a blowout. A blowout is most likely to occur near the end of a drilling program when the well is deep, where pressures are greatest, and oil is most likely to be encountered. In Norton Sound, if a blowout were to occur near the end of the drilling season -- say October 15 -- there is a strong likelihood that there would not be enough time to drill a relief well before ice moves into the lease area.

A recent estimate of relief well drilling time can be found by looking at Exxon's Exploration and SPCC plans for Beaufort Sea OCS-Y-0191 #1. On page 76, Exxon summarizes the time required to drill a relief well in this area. According to their estimates, assuming "trouble free operations, without extraordinary problems", the shortest time frame is 14 weeks (98 days). Thirty-one days of this are spent building a gravel pad and trucking the rig onto location -- activities which would not be required in Norton Sound assuming the use of jack-up rigs. Sixty-seven days are needed to drill the relief well and shut-in the blowout. In the case of our example -- i.e.: an October 15 blowout in Norton Sound

* The exception would be the use of gravel islands in the shallow waters located mostly in the southern part of the lease area. However, the immediate use of gravel islands appears to be unlikely because of a lack of easily accessible gravel supplies.

both the exploratory well and a relief well if necessary. Construction of the additional gravel island will, of course, take time. In the case of the Exxon well in the Beaufort, this was 21 days.

For Norton Sound this time frame is probably too short. The Exxon well is adjacent to the Prudhoe Bay complex. The well is relatively close inshore, and the operator has ready access to an impressive inbentory of heavy equipment, a well developed gravel supply [redacted], and an extensive road system for moving equipment and materials. Such is not the case in Norton Sound. Most of the lease area is relatively far offshore, equipment will be less readily available, gravel will probably be in shorter supply, and transport times will be greater due to distance and the lack of infrastructure.

In addition, it should be remembered that the Exxon well is in the very stable landfast ice behind the barrier islands. Most of the Norton Sound lease area is outside the landfast ice zone. The dynamic conditions of Norton Sound pack ice may effectively preclude any gravel island construction until the following open water season when barges could transport the gravel. In this case, the blowout could also flow for several months before being brought under control.

OILSPILL CONTAINMENT AND CLEAN-UP

Oilspill containment and clean-up in Norton Sound is going to be a difficult, and often impossible task. For the open water periods, most of the equipment presently available is effectively limited to operations in seas of a maximum of about 6 feet in currents of about

1 knot. Recent modifications may have expanded this capability somewhat (to 8 ft. seas), but application of such equipment is largely untested. Under ideal conditions conventional clean-up equipment cannot provide much more than a 50% removal efficiency, yet conditions in Norton Sound frequently exceed the design limits mentioned above. As such, the estimates for open-water clean-up presented in Appendix K are overly optimistic.

Logistics will be another serious problem. Mobilization and deployment of oilspill containment and clean-up equipment will be difficult and time consuming. There are only three airstrips capable of accomodating large transport planes (Nome, Unalakleet, Moses Point), and only one port capable of unloading heavy cargo (Nome). If a spill occurred near the center of Norton Sound it would take a vessel out of Nome about 5-7 hours to reach the spill site. This does not include the time required to load gear and personnel. If a spill were to occur in the eastern or southern portion of the Sound, transport times could approach 10 to 14 hours.

Furthermore, if a large spill should occur, personnel and equipment (some coming from as far away as Anchorage and Seattle) would necessarily have to be unloaded in Nome or Unalakleet and be ferried to the spill site by small aircraft, helicopter, or small boat. This will greatly increase the amount of time required to respond to a spill, especially if adverse weather conditions do not permit the use of such modes of transportation. Under such conditions it might require

this would put the relief well operation into late December.*

The significance of this is self-evident. Freeze-up begins in Norton Sound near the end of October or in early November. Therefore a jack-up rig would have to be out of the area long before a relief well could be completed. This means that the blowout could flow uncontrolled for 8-9 months (until the following summer) before relief well operations could commence.

GRAVEL ISLANDS

Similar problems exist if gravel islands are used in Norton Sound. If a blowout occurs on a gravel island, a relief well may have to be drilled. If this were to occur during the open water season, a jack-up might be used to drill the well, but this would depend on the time of year, water depth, rig availability, etc..

If a jack-up were unavailable, or if the blowout occurred during the witnter ice season, then the relief well would most likely be drilled from a gravel island. In this case Exxon's OCS-Y-0191 #1 plan gives an example of what to expect with regard to relief well operations, with some important exceptions.

First, it is generally accepted that relief wells for gravel island blowouts will require constructing an additional gravel island adjacent to the blowout. This is at least partly due to industry's unwillingness to construct gravel islands large enough to accomodate

* This does not take into account the time it will take to locate a rig and move it to the relief well site. It is assumed that all available rigs will be drilling wells, and that a certain amount of time will be consumed by shutting down and moving the rig.

several days just to transport personnel and equipment. During the winter months, short days, cold temperatures, and the presence of sea ice may add additional delays.

Winter clean-up operations will be even more difficult. Sea ice is normally present in Norton Sound 6 to 8 months out of the year. The effectiveness of most open water containment equipment will be drastically limited once ice concentrations exceed 10 to 20 percent. Although oil removal operations could conceivably continue in the presence of brash or pancake ice, it is probable that the efficiency of clean-up operations will be greatly reduced. Also, safety factors under such conditions may render clea-up operations impossible.

With higher ice concentrations, spill containment and clean-up becomes even more hypothetical. Oilspill response scenarios presented for the Beaufort Sea by the Alaskan Beaufort Sea Response Body (ABSORB) describe clean-up operations aimed largely at spills in the shorefast ice zone. Shorefast ice in the Beaufort Sea is thick and reasonably stable. This permits the use of heavy equipment to construct containment structures such as snow berms or trenches, and for physical collection and removal of oil dpilled on top of the ice*. In Norton Sound, both the strenth and extent of shorefast ice is very limited, with most of the lease area outside the shorefast zone. Because of this, clean-up techniques such as those described by ABSORB for the Beaufort Sea will

* The techniques described by ABSORB in their Oilspill Manual mainly address oil spilled on the ice. Spills under the ice, or in moving ice are still a serious problem.

be impossible to use for much of Norton Sound.

Problems exist with the response scenarios presented by industry in Appendix K as well. For example, the under ice oilspill scenario assumes that oil would concentrate under the broken ice pack. Personnel would drill holes and dig trenches in the ice to further concentrate the oil which would then be burned. Accourding to industry, burning coupled with "secondary recover/flushing techniques" (not discussed in the DEIS) would yield a 50% to 75% recovery rate. (in situ)

Such assumptions are unreasonably optimistic. Evidence from the Kurdistan spill off Cape Breton (one of the few large spills observed in broken pack ice) indicates that the natural tendency for oil spilled in pack ice is towards dispersion and dilution. One of the primary dispersion processes was the grinding of oil in brash ice as a result of floe impact and movement. In the offshore pack, swell propagation caused a leisurely grinding motion which produced oil particles ranging from a few centimeters in diameter down to micron sizes.

A secondary process which also tended to disperse the oil occurred as a result of solar heating on snow/ice surfaces. The ice beneath blobs of oil would melt, causing the oil to be stretched and spread until surface tension effects intervened to produce micron sized oil particles. Individual particles showed no sign of strong adhesion to the ice, and in many cases became trapped as new ice formed over those particles which had become concentrated in melt pockets.

Research evidence also points to several mechanisms whereby oil would be incorporated into the ice pack. For example, oil migrating

into open leads will be compressed to greater film thicknesses, and longitudinal flow along the leads will occur from areas of thick oil to unoiled portions of the leads. This process will continue until obstructions in the leads cause the oil to overflow onto the surrounding ice. Since the ice is in continual motion with leads progressively opening and closing, the oil could be pumped a considerable distance from the area originally contaminated.

When leads close completely the ice on either side of the lead may be deformed into pressure ridges. Before the lead closes, the bulk of the contained oil can be expected to spill over onto the surrounding ice. As the ridge then forms, the oiled ice will be broken up and incorporated into the ridge itself. In this manner oil may become entrapped in the ice thereby effectively preventing any immediate clean-up, and allowing the oil to be reintroduced into the marine environment at a later date when the ice subsequently melts.

Large scale transport of oil in ice is a very real possibility in the Bering Sea. Pease (1979) compares ice generation and transport in the Bering Sea to the mechanic operations of a "conveyor belt". Ice develops in the northern and coastal regions of the Bering Sea, subsequently advects in a south-southwesterly direction, melts along the southern margin of the ice pack, and is replaced by new incoming ice. In this manner, the Bering Sea ice pack is believed to replace itself roughly eight times during the course of a winter. Thus, oil trapped within growing ice could be transported and released several

hundred miles away.

The implications of oil capture and transport are significant when the physical aspects associated with such scenarios are considered. Oil trapped in ice does not weather substantially, instead it retains much of its original toxic components, which can then be later released as the ice disintegrates. Processes normally associated with weathering such as evaporation, dissolution and biodegradation may still occur, but will be extremely restricted. Thus, oil transported in this manner could affect important biological resources and habitats hundreds of miles from the spill source.

XIII. THE IMPLICATION IN THE DEIS THAT THE VARIOUS RULES AND REGULATIONS WHICH WILL GOVERN OCS ACTIVITIES ARE ENFORCEABLE AND WILL BE ENFORCED IS INCORRECT GIVEN THE HISTORY OF ENFORCEMENT IN WESTERN ALASKA.

On pages 12-23 the DEIS discusses mitigating measures that are part of the proposed action. For instance, page 12 states that:

> "Laws, regulations, or orders that provide mitigation are considered part of the proposal. Examples include the OCS Lands Act, which grants broad authroity to the Secretary of the Interior to control lease operations, the OCS Operating Orders, coastal zone management regulations, the Fishermen's contingency Fund, and the Offshore Oil Pollution Control Fund."

The DEIS implies that because these laws, rules, and regulations are in effect they will be complied with and, if they aren't complied with, the violators will be levied with sanctions from the appropriate federal or state agency. Unfortunately, history displays that this has not been the case in Western Alaska in the past. Consequently, we believe that even the strongest mitigating measures attached to the lease sales will be ineffective because they will be unenforceable and unenforced in Western Alaska. What follows is a discussion of sixteen major oil spills which have occurred in the Yukon Kuskokwim Delta region since 1972, the efforts made by the villages and lcoal agencies to have state and/or federal agencies enforce rules and regulations which were broken by the perpetrators of the spills, and the total ineffectiveness of these efforts.

Since 1974, the staff of Nunam Kitlutsisti NK has worked closely with the State Department of Environmental Conservation (DEC) and the Environmental Protection Agency (EPA) to obtain reporting from the villages of oil spills. NK staff has produced bi-linqual tape-slide shows, and two booklets on oil spills prevention and planning, and has also acted as the regional clearing house for reported spills, relaying village reports to the State's Zenith 9300 phone number, and then monitoring State and Federal responses to the reported spills. In no instance has an on-site visit been made by government officials. Listed below are the details of the 14 incidents:

1. 1972, Bethel based barge company.

> In mid-summer of 1972, a barge arrived at Mekoryuk, Nunivak Island, and off-loaded 10,000 gallons of gasoline that were contaminated with diesel oil. The village manager of the oil depot noticed the smell, and immediately tested the mixture. He refused the shipment, making the company pump the contaminated gasoline back into their #1 hold. The barge then continued its journey from Mekoryuk to Kipnuk. When the company got to Kipnuk, its #1 hold was empty. In between Mekoryuk and Kipnuk, it off-loaded its contaminated cargo. NK called EPA and the Coast Guard, but was informed that unless a citation was made, and samples taken, there could be no enforcement. In regard to obtaining a citation, both EPA and CG contended that they lacked the manpower and planes available for in-shore surveillence. No follow-up on the investigation occurred.

2. 1974:Hooper Bay; the same barge company was contracted by the village to deliver bulk diesel fuel to the village depot. The barge arrived during the late fall, and was in the slough in front of Hooper Bay when a severe south wind storm occured, pushing the boat on high ground. Rather then wait for the next high water, the crew deserted the barge. Throughout the winter, the barge leaked fuel. NK's staff was repeatedly asked by the Village Council of Hooper Bay to have the owner pull the bulk fuel out of the barge and put the oil into drums. The owner told NK's staff he was not interested, so NK notified the State and EPA/Coast Guard. After each call from Hooper Bay, NK's staff would again request assistance from government. Finally, in March, five months after the first notices of leaking, the Coast Guard flew to Hooper Bay from Kodiak. They did not check with the Bethel or Hooper Bay parties first to confirm flying conditions, and flew into low ceiling and high winds. The Coast Guard notified the owner, but did not notify the Bethel or Hooper Bay parties of its action. The owner informed NK in Bethel in a rather story conversation and he hurriedly hired a local person to pump the surplus oil out. No follow-up occured, and no fines were assessed.
3. 1968-1973:Cape Romanzoff Early Detection Radar Base
From 1961 through 1968, the base commanders would invite Scammon Bay villagers to take the surplus diesel fuels at the bulk storage depots at Cape Romanzoff to have the tanks empty for the 100% Air Force re-supply barge in the summer. Then in 1968, the command discontinued the practice, and began to let the surplus diesel fuel run down the hill. At the base of the hill is the location of the only spawning area for herring in between Nelson Island and Norton Sound, where intertidal rockweed kelp is found. The discharge of fuel oil into the spawning area disrupted the successful spawn of the herring. The villages of the area normally harvested their herring for subsistence in the two bays adjacent to Kokchik Bay (the bay at the mouth of the Kgun River and Hooper Bay) and then harvest herring roe on kelp from Kokchik. But, the herring eggs throughout Kokchik Bay were stained with fuel oil from 1968-73. Although fishermen from the three area villages complained to the personnel at the station about this practice, nothing was done by either EPA, the Air Force, DEC, or the Coast Guard until Senators Stevens and Gravel finally stepped into the morass after letters of complaint from NK. To this day, herring no longer deposit their eggs in the area of outfall of the small stream entering Kokchik Bay from the Air Force Site, and the herring population of the area did not return to pre-1968 abundance levels until 1977.
4. 1973, Bethel Oil Spill:in early June of 1973, an employee of Nunam Kitlutsisti was awaken by a villager downstream of Bethel complaining of a massive oil spill that he first witnessed west of the Johnson River flats approximately 35 miles from Bethel. The spill stained his nets in an eddy where he was set net subsistence fishing. He stated that the spill had taken place over a three day period of time, and he had followed the spill all the way up river to the Bethel docks. During the summer, people stay up late, so the NK employee approached the beachfront from a high sand cliff adjacent to the beach. The smell of oil was noticeable from the roadway. A person living on the road was out at that time, and remarked that the smell was very strong for the past three days.

There was a visible sheen on the river. The NK employee got into the villager's boat and followed the slick to a tug and barge sitting adjacent to Bethel's breakwall. A discharge pump with an outlet into the Kuskokwim was working at the time, discharging oil into the Kuskokwim. The NK employee woke up the State of Alaska Fish and Game Fisheries Biologist, the individual charged by DEC for rural field monitoring of oil spills. He told the NK employee that he was too tired to do anything and if he had time the next day, he would look into it. The NK employee then woke up the U.S. Fish and Wildlife Service Refuge Manage. He went back to sleep. The next morning, the NK employee called U.S. Fish and Wildlife Service's offices in Anchorage, again obtained no response, so then the NK employee called the offices of Senators Stevens and Gravel, and got immediate action. That afternoon, the biologists from the Fish and Wildlife Service took pictures of the continuing discharge, water samples were taken, and under threat of immediate imprisonment, the barge company stopped the discharge pump. Although sufficient evidence was available, the Coast Guard office of enforcement refuged to seek substantial penalties for the violator, stating that without competition in the area, the barge company owner would re-do his tariff for the following year, and regain his fine from increased freight rates.

5. 1978:Emmonak, Alaska
In 1978, NK was called by three separate fishermen in the Yukon River's South Mouth, complaining about an oil spill from the fish floating processor "The Indian". This particular spill occurred after DEC, Fish and Game, EPA and the Coast Guard had agreed to cooperate on rural oil spills. The villagers stated that their nets had been ruined by a thick, yellow oil discharged from the "Indian". This form of oil is normally waste engine oil. The fishermen immediately alerted the Fish and Wildlife Protection Officer at Emmonak. As the only State enforcement employee in the area, this individual was charged with primary responsibility for investigating spills. He boarded the "Indian" and was told that the owner of the "Indian" had seen a native dump a 55 gallon drum overboard from his fishing boat. Even though the fishermen had told the enforcement officer that they had seen an employee of the "Indian" with a hose over the side discharging the yellow mess, and displayed samples of the yellow goo, the officer terminated the investigation. NK's staff called the officer's superiors in Anchorage and requested he return to the scene. His superiors refused the request. In addition to the reporting through Zenith 9300, NK called DEC officials in Juneau and asked for a member of their Anchorage staff to fly to the site. This telephone call took place after the Anchorage Director of DEC told NK "that with the shortage of money in my office, I am not going to waste a person out there." The Juneau Commissioner of the Agency agreed to look into the issue. Nothing was done, and no fines were levied, although eyewitnesses were present and personnel damage occured. The owner of the "Indian" refused to replace nets of the fishermen whose nets were stained, and ruined by the spill. NK published the full report of the incident in the "Tundra Times". The response by DEC was to terminate all future work with NK.
6. 1978:Tuluksak
After the "Indian incident", the village of Tuluksak called NK and reported that the Bethel barge company filling up the village's bulk tanks had overflowed by approximately 10,000 gallons when the barge company's employee fell asleep during the night.

United Transportation refused to clean up the mess, which had run downhill, contaminating tundra and work areas of the villages, and stained the beachfront, eventually running into the navigable waters of the Tuluksak Slough. NK promptly called Zenith 9300, and persisted in calling supervisory offices of EPA, DEC, and Fish and Game for three days to get an agent on hand. During this time NK advised the village to use its own personnel to clean up the spill as best they could, keeping tract of damages and manpower employed for reimbursement. No agent checked the spill, and efforts to have the Federal or State government check the spill and fine the operator never occured.

7. 1978:Mountain Village
In July, 1978, NK received a call from the Municipal Government of Mt. Village that the road construction shop was discharging waste engine oil into a slough leading into the Yukon River. The Government had complained to the shop managers who persisted in their discharge. Zenith 9300 was called by the village, but no return calls were made by Government oil spill officials. NK suggested that the Municipal Government file damage claims through the Cannery for the discharge, take pictures of the discharge, and collect samples to introduce in State court themselves. NK phone calls to EPA, DEC, the Coast Guard, and Fish and Game obtained no response. Finally, when the lawyer for the Azachorak Corporation informed the company that they were preparing a court suit seeking damages to the fishery the boss of the company from Anchorage ordered his field personnel to cease discharging. An out of court settlement was reached. The following nine oil spills of greater than 1,000 gallons were all reported by Nunam Kitlutsisti staff to Zenith 9300, but in no case did government ever send a field agent to the region for investigation and/or enforcement:
8. Chevak:1976, snowmachine ran over coupling valve, breaking line, spilling 5 thousand gallons into tundra, and into Nenqlikfak River under ice. Village used rags to mop up oil by hand without field assistance.
9. 1978:Crowley Maritine spilled 3,000 gallons plus from a broken hose while filling Chevak's bulk tanks. Captain never reported spill, although village called Zenith 9300 immediately. Captain never fined, and Crowley attempted to charge Chevak for 3,000 gallons Court suit followed.
10. Hooper Bay:1979:5,000 gallon fuel oil spill from subsiding tank that ruptured connecting valve, flowing into thaw lake. Village using rags by hand cleaned up spill themselves. Zenith 9300 called, village fined by DEC in this incident. Village has cleaned up subsequent spill by hand without calling in to prevent further fines.
11. Scammon Bay:Approximately 3,000 gallons of oil were spilled in 1979 when barge resupply company overfilled village bulk storage tanks. Oil went into kgun river. Zenith 9300 called, no follow up. Barge company did not report spill.
12. Alakanuk, 1978:bulk tank leaked into snow over 1,000 gallons. Villages collected snow where run-off occurred, and burned off oil. Oil got into Yukon River under ice. Zenith 9300 called, no follow-up. Village used Oil Spill Prevention Pamphlet produced by NK to contain oil spill.
13. Newtok, 1979:Barge company resupply, fuel line broke, approximately 3,000 gallons; village called NK, who in turn called Zenith 9300. Company never reported spill.

14. Toksook Bay, 1978:bulk tank discharge during resupply, oil moving downhill into Toksook Bay itself. Zenith 9300 called, Company did not report spill, no follow-up by Government.
15. Quinhagak, 1976:barge re-supply, loss of 4,000 gallons into Kanektok River and Kuskokwim Bay. Zenith 9300 called, BIA responded.
1978:same problem, this time with village bulk storage tanks, Zenith 9300 called.
1981:Leak from bulk storage tanks from ruptured valve; approximately 3,000 gallons; called to Zenith 9300; no response by Government although oil got into Kanektok River.
16. Eek; barge re-supply during summer, overflowed storage tanks in 1977; spilled into tundra, and into Eek and Kuskokwim Rivers; no government response.

In conclusion, even with timely reporting of oil spills by local governments and organizations and private citizens, the government response to those spills has been nearly non-existent. The government agencies with responsibility for enforcement simply lack adequate manpower and equipment to respond to spills located in geographically isolated areas in the Yukon-Kuskokwim Delta. Government response has been meager either in helping clean up oil spills or levying sanctions against those responsible for the spills. The DEIS should recognize that this problem will continue unless funding drastically increases for the government enforcement agencies, and that as a consequence compliance with relevant rules and regulations will most likely be poor at best.

CITY OF TELLER
P.O. BOX 548
TELLER, ALASKA 99778
OCTOBER 5, 1981

Prepared by Morris Kugzruk

This statement addresses the proposed sale number 57 and the Environmental Impact Statement prepared by the Bureau of Land Management. This statement represents the general opinion of the City of Teller and the people of Mary's Igloo. Recommendation of the proposed sale will be made at the end.

Timing of Lease Sale

The Federal Goveernment has been in a big rush to lease tracts for Oil and Gas in Alaska's Outer Continental Shelf. For this reason, the public affected by the proposed lease sales have little time to prepare for the statement. For the villages affected, there is not enough time to read the Draft Environmental Impact Statement, analyse it, check it for accurateness, and to prepare a statement. Even and organization, the size of the State of Alaska, with their staff, probably could not prepare a statement as accurate as they would like. Villages have hardly any funds to prepare for statements, They also have limited personnel or grantswriters, if any. The City of Teller has applied for planning grants twice through the Coastal Energy impact Program in 1979 and 1980. The response to the grant applications simply stated that grants were allocated elsewhere because there was no immediate need for the Nome area since it won't be affected for several years. Because of the Federal Governments rush to lease, the Oil Industry, capable of paying millions of dollars for tracts of land, may end up paying only a few million.

Exploration Phase

The impact statement estimates that approximately 45 wells may be drilled during this phase. They expect supply barges and ships to come and go during this period as well as helicopters traveling back and forth from the Nome airport. Because of this activity the marine mammals, fish and water fowl may be hampered during their migration. During their migration they take their time, feed along the way, look for mates, look for places to rest, etc. Many travel along the coast line and some will be traveling near the exploration wells. Some species use as a hauling area or areas or have pupping habitats not far from the exploration area. Some occupy the open water in the summer time when the exploration phase is expected to occur. During the peak exploration activity, some may not follow their normal migration routes.

Development and Production Phase

A lot of activity by the Oil Industry will take place, if Oil is found, during this phase and it is this phase that will require serious attention. 172 development wells are expected to be drilled from some 9 platforms. Construction activities would be taking place both on land and in Norton Sound if it comes to this phase. Also Nome may be building its deepwater port or causeway. There may be trunklines being placed, Oil terminals, gas compressor station, and industrial infrastructure built. This would indeed be a busy part of the proposal. This type of activity may require up to 3000 additional employees. Hydrocarbons are expected to be processed on a platform and than pumped to shore by an 18 inch oil pipeline and a 14 inch gasline. Some 186 miles for each pipe system would be required and they are to be buried under water. A lot of questions now come to our minds about the impact all this activity will have on our region, marine mammals, fish waterfowl, and the whole ecosystem and the enivronment.

Oil and Gas Pipelines

If the pipes are to be welded together than strict requirements should be imposed and met by the Oil industry. When the pipes were welded together during the TransAlaska Pipeline Era, a lot of the welds were under controversy. X-rays taken of the welded pipes were found to be improperly welded on some pipes. There were oil leaks detected along portions of the pipeline and this was on land. Sections of pipes had to be dug up and repaired or replaced. Just imagine what would happen if there were improperly welded pipes in the Norton Sound Basin. Since the water freezes over Norton Sound and it turns into ice, oil leaks would be hard to detect during the winter and it would be hard to determine how bad the leaks are unless the Oil industry has detection devices.

Oilspill Risk

Oilspills can be expected from platforms, pipelines, tankers and storage tanks. As mentioned above, oilspills have occurred along the TransAlaska pipeline. If oilspills occur, we could expect the oil to spread on the surface of the water in Norton Sound and if not contained in time could spread to the Bering Straits. We have experienced stormy weather many times in our area as well as flooding in most of our villages. Just imagine what would happen if oilspill occurs during the stormy days. The Draft Environmental impact Statement projects a low potential impact on land segments for the proposed lease sale for most of Norton Sound. in stormy days, the low potential impact would suddenly become a high potential impact for many Norton Sound villages.

Oilspill Preparedness and Response

According to the Draft Environmental impact Statement, only minimum equipment and supplies for initial containment are to be based at the drilling site and can function in waves up to 5 or 6 feet. Than too there is no mention of Oil tankers carrying any containment equipment or supplies for oilspills. Apparently, in the case of major oilspills, supplies and equipment would have to be flown in from somewhere. This makes a person wonder if in the case of major oilspills, if there would be any equipment and supplies immediately in the State of Alaska.

impacts from Increased Population

Under Alternative I, the impact estimates approximately 3000 additional workers may be in the Nome area during the peak of the proposal. While most of the employees may be stationed at a construction camp by Cape Nome, many off duty employees could be expected to go to Nome for some recreation, sightseeing, or whatever. Initially, we could probably expect to see lines at the post office, telephone booths, bars, restaurants, ivory shops, trading posts and other places of business.

A small percentage of Oil industry employees could probably be expected to be based at the city limits in Nome along with their families. During the Trans-Alaska Pipeline Era, many people from the states moved to Alaska to look for employment with the hope of finding high paying jobs. We could probably expect an undetermined number of people to go to Nome, looking for jobs also. This would create housing shortages, inflation due to the demand for increased services, etc. More policeman would be needed, larger hospital, increased health care and services, larger schools, larger electrical generators, and everything connected with businesses and services. Villagers when traveling to Nome buy a lot of groceries, snowmachines, outboard motors, boats, and most depend on Nome for their guel oil, gas and other oil products. This means that villagers would have to buy these products at increased prices. Than too, the oil industry will be hiring experienced and trained personnel. With the current unemployment rate at Nome and the surrounding villages and with the untrained personnel in the area, many will still be unemployed. With increased prices on all goods and services, regional residents could be expected to experience some hard times.

Conclusion and Recommendation

Considering the impact that the oil industry may have on the region, it appears that the villages and the region are not ready yet for the "boom town" conditions that may occur if oil is discovered in the Norton Basin. If oilspills occur, our whales, walrusses, seals, fish, waterfowl and the food that they feed on would be in danger. The oil industry needs to consider what appropriate technology would be required to safely transport the oil from the Norton Basin if it is found. Biologists do not yet know the long term effects are on our marine mammals when they have been exposed to oil spills. We recommend a delay on the lease sale.

VAN NESS, FELDMAN, SUTCLIFFE, CURTIS & LEVENBERG
A PROFESSIONAL CORPORATION
1050 THOMAS JEFFERSON STREET, N. W.
SEVENTH FLOOR
WASHINGTON, D. C. 20007
(202) 331-9400

S. LYNN SUTCLIFFE
HOWARD J. FELDMAN
WILLIAM J. VAN NESS, JR.
G. WILLIAM FRICK
BEN YAMAGATA
ROBERT G. SZABO
GRENVILLE GARSIDE
GERRY LEVENBERG, P. C.
ROSS O. AIN
ALAN L. MINTZ
ROBERT R. NORDHAUS
CHARLES B. CURTIS

GARY D. BACHMAN
R. KEITH GUTHRIE
PETER O. DICKSON
JEFFREY S. CHRISTIE
NANCY E. WILLIAMS
ADAM WENNER
RICHARD D. RATHVON
ELLEN D. SWYLER
GARY L. FONTANA
SUSAN TOMASKY

October 16, 1981

Manager
Alaska Outer Continental Shelf Office
P.O. Box 1159
Anchorage, Alaska 99510

Dear Madam/Sir:

Enclosed please find comments prepared by the Alaska Eskimo Whaling Commission on the Draft Environmental Impact Statement on the OCS Proposed Oil and Gas Lease Sale in the Norton Sound.

A copy of these comments has been delivered to Mr. Ralph Ainger in Washington, D.C.

Sincerely,

S. Lynn Sutcliffe
Counsel to the AEWC

Enclosure

COMMENTS ON NORTON SOUND DRAFT

ENVIRONMENTAL IMPACT STATEMENT

The Alaska Eskimo Whaling Commission (AEWC) appreciates the opportunity to provide comments on the Draft Environmental Impact Statement on the OCS Proposed Oil and Gas Lease Sale in the Norton Sound.[1/]

INTRODUCTION

The AEWC is a non-profit corporation comprised of all whaling captains from the nine Alaskan Eskimo whaling villages on the North Slope of Alaska. The whalers in these villages take bowhead whales using the traditional methods of the Eskimo people. The AEWC represents the thousands of Eskimos who participate in one form or another in the Spring and Fall hunts that are a central part of the Eskimo culture and who rely on the bowhead whale for a substantial part of their nutritional needs.

Three of these whaling villages will be directly affected by the proposed oil and gas lease sale in the Norton Sound -- specifically the Saint Lawrence Island villages of Gambell and Savoonga and the mainland coastal village of Wales. However, activities which impact the bowhead, regardless of where those activities take place, affect all of the villages whose subsistence depends on that whale.

1/ The AEWC Scientific Advisory Committee, upon request of the Bethel Native Corporation, is providing additional comments on the Draft Environmental Impact Statement under separate cover. The AEWC endorses those comments.

As a result of commercial exploitation, the exact status of the Bering Sea stock of bowhead whales has been a subject of much debate. The bowhead whale has been listed as an endangered species under the Endangered Species Act, 16 U.S.C. §§ 1571, et seq., since 1970. The Eskimos have been continuing to take bowhead whales pursuant to exemptions for native taking for subsistence purposes contained in the Endangered Species Act as well as the Marine Mammal Protection Act, 16 U.S.C. §§ 1371, et seq. And, in 1977, the National Marine Fisheries Service made a finding under the Marine Mammal Protection Act that the bowhead whale should be classified as a depleted species.

The international community expressed its concern about the status of the bowhead population in July, 1977, when the International Whaling Commission (IWC) voted to prohibit the native taking of right whales.[2/] In December, 1977, and at every subsequent annual meeting, the IWC has agreed to permit a limited take of bowheads by Alaskan natives each year.

The AEWC was established in August of 1977, shortly after the Eskimos were first apprised of the international concern with regard to the status of the bowhead whale. Since that time, the AEWC has provided assistance and resources to help scientists determine the actual status of the stock and its net recruitment rate as well as the impact of oil and gas development on the whale. The AEWC has also developed and implemented

2/ The bowhead is a species of right whale.

a management plan for each year's subsistence hunt designed to insure an efficient harvest of bowheads and to provide a means within Alaska Eskimo customs and institutions of managing the bowhead hunt to prevent extinction of the stock. In addition, the AEWC has been conducting public education concerning the Eskimos' need for subsistence whaling and has been developing an extensive research program to learn more about the bowhead.[3/]

DISCUSSION

The Draft Environmental Impact Statement (DEIS) on the Proposed Oil and Gas Lease Sale in the Norton Sound discusses at length the importance of the bowhead whale to the Alaskan whaling villages. The DEIS also points out the shortcomings of the data base with respect to the impact of the proposal on the bowhead whale population as well as the Eskimo villages dependent upon the whale. In addition, the DEIS acknowledges that the proposal and the alternatives that do not delay or halt the sale would very possibly adversely affect the whales. No attempt is made to assess the significance of such impacts.[4/]

3/ Despite the fact that it is the federal government's responsibility to conduct the research necessary to assess the impact of OCS development on the bowhead whale, the AEWC will continue to conduct its own research program to try to provide some answers to these fundamental questions.

4/ The Federal government has an obligation under the Endangered Species Act to protect endangered species; this obligation cannot be obviated by professing ignorance as to what the consequences of a federal action may be.

It is the AEWC's view that the government should pursue Alternative III, delaying the sale, until the impact on the whales of the activities associated with the sale can be assessed (which is becoming more difficult as the government reduces the amount of money available to fund the research that would make such assessments possible). The AEWC strongly believes that until such assessments are made so that protective stipulations can be incorporated in the leases,[5/] the government will not have met its statutory obligations under the Endangered Species Act and its international obligations under the Whaling Convention Act of 1949, 16 U.S.C. §§ 916, et seq. The AEWC also points out that under the House and Senate-passed amendments to the Marine Mammal Protection Act, incidental takings of endangered species during the course of a specified activity (presumably defined to include oil and gas development) will not be permitted.

If, however, the Secretary decides to pursue any of the Alternatives which provide for immediate development, the AEWC, without prejudice to other rights and remedies, recommends at a minimum the incorporation of the mitigating measures mentioned in the DEIS as to seasonal restrictions on drilling, testing, and other downhole exploratory activities (specified in Section II.B.1.c (p. 16)) to assure protection to the whales during

5/ This, of course, assumes that such stipulations will not be waived even if they prove to be inconvenient.

their Spring migration. In addition, if the long-awaited biological opinion from the National Marine Fisheries Service recommends any other protective measures, the AEWC would expect that the Secretary would also include those measures as lease stipulations.

CONCLUSION

The purpose of these comments is to stress the AEWC's concern that the state of knowledge as to the impact of oil and gas development on the continued viability of this endangered species of whale is not at a point where scientists can even hypothesize, let alone conclude, that such activities will not jeopardize the species.

The federal government has international as well as national obligations to protect the bowhead whale as well as a trust responsibility to the Eskimos to do so. The DEIS acknowledges that the impact of the proposed oil and gas lease sale on the continued viability of the bowhead is unknown. The AEWC believes that the Secretary should adopt Alternative III in order to delay the sale so that the government can conduct and conclude the necessary studies on the impact of offshore development and thus incorporate protective stipulations in the leases. At the very least, the seasonal restrictions on certain activities as recommended in the DEIS should be adopted if the sale is conducted as scheduled, as well as any recommendations offered by the National Marine Fisheries Service.

COMMENTS ON NORTON SOUND DRAFT
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Alaska Oil and Gas Association

AOGA

505 W. Northern Lights Boulevard
Suite 219
Anchorage, Alaska 99503
(907) 272-1481

October 15, 1981

Ms. Esther Wunnicke
Manager Alaska OCS Office
Box 1159
Anchorage, Alaska 99510

Dear Ms. Wunnicke:

Subject: COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL AND GAS LEASE SALE 57 (DEIS)

The Alaska Oil and Gas Association (AOGA) is a trade association whose 36 member companies account for the bulk of oil and gas exploration, production and transportation activities in Alaska. Our membership includes the largest and some of the smallest petroleum firms in the industry. AOGA is the Alaska division of the Western Oil and Gas Association.

The Alaska Oil and Gas Association (AOGA) has reviewed the subject DEIS and submits the comments contained herein for consideration in the Final Environmental Impact Statement. General comments are provided below, and detailed comments have been typed directly on the enclosed copy of the DEIS.

AOGA supports the proposed OCS Lease Sale in Norton Sound. Clearly, this action is one step towards reducing United States' dependence on foreign sources of oil. The subject DEIS' clarity and organization is improved compared to similar, earlier documents.

The statement at the beginning of the document disclaiming its use as a planning document is to be commended. It may help local residents of Western Alaska understand that the DEIS outlines a spectrum of things that could happen and not an accurate prediction of what will happen.

Voluminous data, particularly on marine mammals, is provided. Incorporating this data into appendices and reducing the size of the main document would be more in the spirit of the new CEQ regulations aimed at producing a more compact, readable document.

AOGA would like to emphasize the following points:

- The DEIS is often quite negative in regard to possible impacts. The following is one of many examples:

  > The relatively high probability of oil spills moving into offshore areas immediately west of the proposed sale area suggests that if spills occurred during periods of peak spring and fall migrations, substantial adverse effects on populations of walrus, bearded seal, spotted seal, and beluga whale are possible, but unlikely, given the assumed rate of oil spills associated with the proposed sale area. (Emphasis added.)

- The social and economic sections are written in an idealized and paternalistic style. Making predictions such as increased family stress, alcoholism, drug use, outmarriage, housing shortages, and inflated prices serves only to unnecessarily disturb local residents, and harden their resolve against development.

- The overly optimistic development schedule unrealistically compresses construction and drilling activities into a few years, which supports a boom/bust prediction. The assumptions made and the methodology used to develop the schedule should be stated. The schedule assumptions are critical to the impact assessment and should be revised to reflect a 10 year period between discovery and first production.

- A suggested mitigating measure would limit oil industry activity to the period between July 1 and October 30. We recommend it be deleted because it has not been demonstrated in the DEIS or elsewhere that marine mammals, including endangered whales, are susceptible to oil spills, and because the risk of exposure is so low.

- The suggested mitigation measure to prohibit offshore storage in the southern lease blocks to protect the Yukon-Delta Area from oil spills is unfounded. A better mitigation measure would allow storage and loading of produced oil in the southern blocks, upon demonstration to the Deputy Conservation Manager that such storage and loading can be safely accomplished through sound engineering principles and operating procedures.

- This DEIS, like prior Environmental Impact Statements, exaggerates the oil spill issue. The USGS' predicted spill volumes do not sufficiently take into account industry's improving safety record, which is evidenced by fewer spills and smaller spill volumes in the last five years. Industry's excellent record in the Cook Inlet should be mentioned for the public record in the DEIS.

In summary, the emotional language in the social impact section and the exaggerated likelihood of oil spills are viewed as the most serious flaws in the Draft EIS. Carefully conducted local and industry planning, coupled with close monitoring of the social and economic environment during the development, will rationally mitigate local concerns and impacts. Conflicts may occur, but are certainly not insurmountable if all parties act together in a common sense approach to solve problems. In addition, improved industry practices coupled with governmental agency monitoring has reduced the likelihood and probable severity of oil spills.

Sincerely,

WILLIAM W. HOPKINS
Executive Director

WWH:tp

Enclosure

XIV. THE DEIS FAIL TO ADEQUATELY DISCUSS ENVIRONMENTAL HAZARDS FOUND IN THE NORTON SOUND REGION.

Since the publication of the DEIS, the villagers adjacent to the proposed federal tracts have gone over the opinion of government concerning the geophysical hazards of the DEIS on oil andgas development. In addition, staff to the Y-k CRSA Board who were in attendance for the Norton Sound Synthesis meeting discussed the graph of page 31 of the DEIS Table III.A.1.-1, Environmental Hazards in Norton Sound Proposed Lease Sale 57. The staff revealed to the villages the separate opinion of federal and independent scientist at the meeting on each of the Hazards as they affect facilities and their siting prior to the compromises that were reached leading to the concensus positions exhibited in Table III.A1.-1 for Severity of Hazards, Technology, and Need for Additional Data. From these reviews, the following comments and alternate information is being presented:

A, Ice Forces

Stable Fast Ice: the villagers familiar with the coastal environment of the Delta confirmed the brief statement on page 32. They pointed out repeatedly in their testimony that the changes that can occur like ice push, override, and pile ups throughout the winter period, seasonal variations in environment being dramatic. In addition, the villages repeatedly pointed out that both the frequency that this can occur(seven storms within the month of November that lead to movement of shorefast ice in December, 1942@), the mobility of the shore fast ice when flooding occurs, not only break up and moving on-shore, but off-shore at great speeds during the winter in post storm surges, and how fast, rubble piles and override occur. All witnesses concurred that ice did not submarine shore fast ice, but that the sediment gouging that occurs was due to the pressure of the ridges bearing down into the sediment during periods of storm. In periods of time when ice was forming, and storms occured, several witnesses spoke about shoreline gouging directly related to annual ice movements into the shoreline. A fourth major area was the force of the ice movement and the rapidity of overrides during a strom. Many witnesses spoke about ice overrides building up over 30 feet in less then 3 hours. One witness explained a override of 20+ feet in less then one hour. Evan Oison of Emmonak testified that in a period of fifteen minutes, he witnessed an override build up of greater then 15 feet. The fifth major

concentrating on additional scientific research on how ice forms and moves in the neashore ice pack zone, how this zone fractures during storms and periods of high water and changing currents, and the speed that this ice moves with west to north winds, which are more usual winds of this region in the winter. Several elders, particularly in Kotlik and Sheldon's Point, mentioned that during break-up of the nearshore pack ice during storms and in the spring, that the pressure ridges overturn, and sediment can be clearly seen. One elder stated that once after the ice became stable, he approached one of these inverted icebergs, and the sediment was as "long as a man", Hans Nelson recorded ice gouging in these areas in Figure III A. 1.-2

Polynas: coastal villagers from Kotlik to Nelson Island reported a common event in the formation of shorefast ice, and that is the quick development of thin(1-3 ice) on the mud flats during the fall transitional season. This thin ice then moves off the mud flats with the tide and moves ashore or into rivers, or off-shore depending on wind, and is very damaging. Ice overrides occur with this type of ice also, and when associated with high winds and flooding, this type of ice acts as a lawn mover to shoreline obstacles like tundra mounds and willows. This ice is elastic, and does not fracture, and can build to heights taller then a man in less then 1 hour. Villages maintain that this ice can move faster then a outboard driven boat, and several witnesses gave testimony to this form of ice penetrating aluminum skiffs, and sinking boats by going over the battenboard and then piling up inside the boat.

In summary on ice forces, the villages believe that ground truths confirming satellite analyses of the ice forces at work within the proposed lease areas, and adjacent areas that would be affected by oil development and its secondary effects, must occur prior to Government making a decision concerning potential ice hazards. Only the villagers who occupy the Norton Sound area are familiar with annual, and unusual ice events, and through their public testimony, they have tried to broaden the Government's knwoledge. The issues that they bring up, the effect of currents and winds in years other then the test years on ice formation and movement, direction of ice movement, currents under the ice in regard to oil spill projectories, circulation under the ice, movement inthe water column beneath the ice and wave action in lead areas, significant variations in water and air temperature that causes freezing and thaw cycles, and changes in wind direction, leading to occassional winter on-shore winds,

concern was the movement seaward of the shorefast zone. When questioned if the gouging, overrides, and rubble piles were a near shore event solely by Hearing Panelist, wintesses responded that these similar effects were witnessed far off-shore in the Flaw Lead areas, normally deeper water due to the build up of shorefast ice resisting further ice impacts. Witnesses from nelson Island and the DElta reported ice overrides and build-outs evident 20 miles seaward from the shoreline.

Flaw Lead Areas: the most significant evidence offered in addition to the comments on Page 32 was the tremendous grinding force at this zone between the moving nearshore pack ice and the shorefast ice. Many witnesses explain from firsthand testimony on how this region was ever changing, with dramatic changes in the size of the leads within 10 minute periods of time, high wave action during periods of south wind changing to southwest winds, and grinding away of shorefast ice at the interface with moving pack ice. In addition, wintesses referred to the ice overrides, ridges, and rubble piles being formed in this zone in short time spans, and then breaking away, being carried by the currents, and grinding into both shorefast and nearshore pack ice in the lead areas. Seal hunters referred to this ice as being very dangerous, and unpredictable, for the winds/currents could change in the flaw lead area, and move this ice great distances. One witnessed referred to dropping a stick in the water, and races against the current off shorefast ice to catch the stick, and it was moving faster then he could run, and the flaw lead ice was moving at that same speed.

Nearshore Pack Ice Areas: villagers who hunt this region spoke about being trapped in the nearshore pack ice, and moving great distances away from shore and towards shore due to changes in current and wind. A review of scientific literature and discussions with lead scientists in this field reveals a lack of experience other then satellite imagery. In addition, those years when research was undertaken on winter ice movement with OCSEAP funds from 77-80, unusual winds dominated the area, being principally from the south. The elders repeatedly mentioned that the last time that this type of event of four years of southern winter winds occurred was during World War I. The elders were very concerned that the movements they have lived in in this ice field were not fully revealed, principally

and the significance of ice pressure ridges, overrides, and rubble piles.

B. EARTHQUAKES AND SEISMICITY: Regina Andrews of Kotlik reported on one tidal wave during the 1920's, and Joseph Mike and William Teeluk of Kotlik, then living in Pastolik reported two separate tidal waves in the 1950's. In each case, no earthquake preceeded the walls of water. In regard to earthquakes, people have occassionally felt the earth move. During the 1964 Anchorage earthquake, one man reported that he was ice fishing through spring ice over 4½ feet deep, when he noticed that the water was flushing up and down in the hole. He did not notice any movement of the ice or land, and said that the water level dropped to the bottom of the hole then rose up. There was very little spillage above the lip of the hole.

C. STORM SURGES (reference pages 34 and 39); the greatest part of factual information from the villagers of the Delta region concentrated on this issue. The DElta is periodically flooded. The flooding occurs annually through spring break-up and from fall storms during the transition period which covers the coastal areas. During these annual events, ice is brought ashore and deposited on the land. During these annual events, if the flooding is significant, and the ice moving fast, shearing of tundra and willows occurs. During these annual events, silt is deposited on the land, and unstable banks and sand islands above the permafrost line are washed out by the receeding flood waters.

In regard to unusual flooding, the summary of testimony by the elders of the coastline reveals that heavy flooding is a random event, with major floods occuring at least once every 8 years.

Summary: 1913: heavy flooding up to New Hamilton on Apoon Slough or North Mouth of the Yukon in December, approximately 18 miles inland

1918: flooding to Bill Moore's Slough on Apoon, and to Sunshine Bay on Kwikluak Slough or South Mouth

1924: flooding up to NewHamilton, on Apoon, covered landmass under current site of Emmonak up to Fish Village, all of Black River up to Knockhock, surrounding Hooper Bay, flooding Kashunak River area up to Old Chevak, and coastal lowlands to Baird Inlet north of Nelson Island

1932: high water up to Bill MOore's Slough, and surrounding Alakanuk

1938: high water in same areas

1942: high water to Emmonak again, but surrounding the village

1949: high water on Black River, and up to Old Chevak, and to Alakanuk on Kwikluak

1958: to Bill MOore's Slough

1968: high water inbetween Sheldon's Point and Alakanuk

1974: high water, flooded all houses in Sheldon's Point, sourrounded Alakanuk, and old townsite of Bill Moore's Slough, up to bottom of Scammon Bay and Chevak hill, and just below Newtok. Did not extend as far as 1924 flood in debris line

1978: high water, surrounded Chevak and Scammon Bay hill, washed out Hooper Bay road and airport, covered Sheldon's Point and reached Bill MOore Slough townsite.

Additional concerns with storm surges during open water and ice periods involves transport of sediments of these storm surges, effectof the salt wedge, erosion of beachfront and unstable sediment in both storm surge and post-storm surge, gouging of tidal lowlands by onshore ice movement, removal of permafrost layer by wind/wave/ice action, contamination of fresh water sources by salt water, snow storms and fog associated with storm fronts, and how all of these issues relate to discharge of both crude and refined spills from exploration and their support activities.

Sediment Transport: the wintesses at the Emmonak hearing repeatedly referred to the large amount of mud being deposited on the tundra and in the flooded homes of the villages after periods of high water. Dr.Sharma, of the Institute of Marine Sciences at the University of Alaska, Fairbanks (Enclosure #4) states that the geotechnical qualities of the Yukon River's discharge will from similar studies anneal hydrocarbons, and cause them to sink, and become part of the submarine sediments of the Delta tidelands. Given the shallow bathymetry of the Delta, storm activities will continually stir these oil ladened particles, and surges will bring them through either the salt wedge or storm surges upchannel or overland for deposition on the tundra. Very little is mentioned in the DEIS about this unusual event in the Yukon Delta. In regard to low term impacts, the DEIS does not mention this issue as a significant environmental hazard. In regard to balancing, the short life of the oil development and potential development could have far reaching, long term impacts on the Delta long past active oil development due to sediment transport. Mr. Alfred Redfox of Emmonak

quoted Mr. Andrew Hamilton, 81 years old who was born in New Hamilton, who mentioned the fact that when the wind was from the south, and strong, and then turned to the west, the salt wedge would rise and surround the village of New Hamilton. Axel Johnson in a personal communication confirmed Mr. Hamilton's statement. Charles Hary of Alakanuk also raised the issue of the sediments being constantly turned over, and like Mr. Hamilton referred to times when the south to west strong wind shift brought the salt water up far inland, and that the salt would get into the fresh water ponds, and sediment would be left from this flooding on the Delta and in the fresh water lakes inland. The 1924 storm, taken as the worst case scenario would reveal a map of a major portion of the coastal area being inundated, as far inland as Emmonak on the Yukon River's Kwikawak Channel, to New Knockhock on the Black River, Old Chevak on the Kashunak River, and the flats north of Nelson island as an outline for oil pollution from either direct spills, or from sediment transport both during potential oil operations, and long after the cessation of these operation if oil is collected in the submarine sediments of the Delta.

Salt Wedge: reference ismade to the Norton Sound Synthesis report in which further study on the Salt Wedge of the Yukon River is a significant data gap, and the reference in the Emmonak Hearing by Hamilton (through Redfox) and Hary locally confirm the existence of the wedge. The Synthesis quotes one scientist as learning the wedge extends all the way to St. Mary's during low water months, and the DEIS mentions the wedge going to New Hamilton (W. Kamkoff, personal communication). Both Hary and Hamilton referred to the wedge being in existance not only in low water months under the ice, but in warmer parts of the year, and affected by the wind patterns. We feel that in the FEIS, this issue should be treated more significantly as a long range environmental problem in association with sediment transport.

Erosion of Beachfront and Small Coastal Hills: reference was made at the Emmonak Hearing by Chikegak and Bunyan of the effect of winter storm surges under the ice and how large areas of the Delta are remodeled by moving ice. Paul Redfox described (personal communication) how the low hills adjacent to the coast line and their willow fronts are residues of the 1924 storm, where large chunks of frozen tidal mud were torn out by the storm and placed upland. Bunyan stated (personal communication) that the small lakes adjacent to the tidal portions of the Black River were made by the 1924 storm, where large patches of mud below the permafrost line were gouged out by moving ice, and deposited

Erosion(cont.)

further inland, forming the small hills of the lower Black River. Guy Mann mentioned that many of the small hills formally surrounding Hooper Bay were removed by the ice in the 1924 storm, and that significant erosion of the large moraines in the northern portion of Hooper Bay were gouged by the moving ice.

Contamination of Fresh Water Source:after the 1924 storm, Guy Mann of Hooper Bay, Tim Matchian of Chevak(personal communication), and Andrew Hamilton stated that the people had to use ice from lakes on the land that winter for drinking water, for the shallow lakes that normally were used were filled with salt water and salt water ice. Rain water rather then the lakes were used. Tim Matchian of Chevak stated that the people of the Kashunak area had to go far inland to find fresh water that summer, for all of the lakes in the flatlands of the Kashunak were salted, causing the people a significant disruption . In addition, many witnesses(Cecilia Foxie, Regina Andrew, Guy Mann) spoke of the habitat changes that the salt water brought, the change in wildlifs, and the dying of the shallow lakes biota, and replacement by salt water primary producers. All made reference to ths long time span(3 years) it took for the fresh water biota to replace ths salt intrusions. A significant data gap is the cumulative effects salt intrusion on the surface lands coupled with either an acute oil spill, or oil ladened sediments caused by storm surges in either open water or ice period might have,

Snow Storms and Fog:given the few weather stations used as benchmarks in the meteorological data on Norton Sound, it is important for BLM to research the days of travel allowed to commercial mail plane service for a twenty year history, to determine the frequency of high winds, and inclement weather(fog, snow) as additional data for risk analysis. As Alfred Redfox stated, if damage occurs, it is very likely that harsh environmental conditions contributed to it, and those very same weather elements could prevent rapid deployment of support and containment equipment. It is not unusual to have 5 straight days of zero(altitude)-zero(distance) weather in the Yukon Delta associated with storm surges. BLM in its Oil Spill risk analyses has not included this portion of the local weather system as a function of trajectories and clean-up. A model should include the site specific nature of the weather stations with the commercial routing into surrounding villages. Cape Romanzoff as a weather station is situated on a rocky escarpment; the villages surrounding this weather station lie

in tidal lowlands. When Cape Romanzoff reports inclement weather, low visibility and ceiling, the villages can bs 2000 foot ceiling and 10 miles visibility, and vice versa(Sparck, personal communication, Sante Fe Flying Service, Hooper Bay personal communication, Delta Air Service, Emmonak Alaska, personal communication) The magnitude of change within local areas of the Delta has not been appreciated by the meteorlogical data. A second major point is the time of change from prior weather reports. From the same sources, cited above, the variability of weather is extreme, and on-shore breezes in both the spring, summer, and fall come up very fast, bringing off-shore storms in intermittant waves, so within an hour period of time, local airfield can be zero-zero, and five minutes later be ceiling-visibility unlimited. In the winter, fog and snow in intermittant waves during wind storms, and hanging over an area in times of wind for days at a time are usual events, and are often times independent of the few weather stations reporting from coastal areas.

ON-SHORE WINDS:normally associated with tides, ths spring-summer-fall on-shore winds are a constant event in the coastal areas. Mosquitos are very rarely bothersome in the coastal areas due to the constant daytime wind. Sparck(personal communication) remembers in his calendars of summer fishing, only four of eleven summers of fishing in the Hooper Bay area where three consecutive days of no wind above 9 mph occured. The highest winds during those calm days were during the changing of the tides. Because of the significance of these on-shore winds, ths Norton Sound Draft Synthesis report Scientific panel on the Yukon Delta determined that a comprehensive research program dealing with on-shore winds should be undertaken by BLM as one of its three most significant data gap concerns.

CURRENT SCOURING

Joseph Mike, Kotlik, Dick Bunyan of Hooper Bay, and Guy Mann of Hooper Bay reported that after storm surges leave the land, that sand islands recently constructed in mouths of river, less then 2 years old, would disappear after the water left the land quickly. Jerome Woods and Francis Nanok of Chevak(personal communication, both men now deceased) reported that one time during a summer storm where they were stranded in their kayak on a sand island in Angayarak Bay in the Mouth of the Kashunak River, that the sand bar was washed away with the receeding flood tides, and that it was very dangerous for them in their kayaks to go against the outgoing waters and reach the nunapik or tundra. Axel Johnson and Charles Hary (personal communication) doubted the DEIS language that"current scouring generally occured around objects and from beneath objects." Both men stated that when a drum or motor sinks into the sediment of the river, or a stick is placed in the

mud to anchor a small fish net, that instead of scouring, the mud compacks around and over the object, making it very difficult to pull away after one tide. Conversely, Guy Mann upon reading the same statement, declared that in the sandy beaches at the very tip of the sand bar adjacent to Hooper Bay where sand occurs, that sticks placed in those area are current scoured similar to the DEIS statement becsuse it is sand. Mann stated similar events occur in the Kokchik Bay area's sandy beaches of Cape Romanzoff. It is apparant that when soft submarine sediment is nvolved, current scouring occurs differently then in coarse particle sands. All villagers who spoke to the issue of off-shore projection stated that only in very rare places near the south mouth, and in one area of the middle mouth where tidal eddies occured did sand exist. From their experiences, the majority of submarine sediment off the coastline was mud, and objects lost overboard for short periods of time were difficult to remove,

BIOGENIC GAS

Jake Johnson(personal communication) reported that on two occassions, as he has checked his fish net across the Yukon River from the mouth of the Kwiguk Slough, he has seen water eruptions on the far side of the river. The eruptions lasted for longer then 10 minutes each; on one occassion, ice 1 foot thick was broken in the eruption. Robert Wassili of Emmonak reported that where he has his fish net in an eddy in a similar location that he has witnessed numerous eruptions, one breaking through ice greater then 1 foot thick. Rudolph Williams explained how in the lakes and river surrounding Kotlik, it is very common to see bubbles of methane that smell like human waste trppaed in the ice, and that when they are punctured with a knife, and the hole sealed with knife, until a match is lit, that the gas escaping when the knife is pulled back, burns. Mark Okitkun of Kotlik mentioned at the meeting that in the springtome, he had witnessed a blow up in a lake 10 miles west of the North Mouth of the Yukon. The gas eruption lasted 30 minutes or more, and exploded over 8 feet in the air, taller then a man. Most village spokesmen spoke of the methane(human waste gas) smell of gas as it escales the peat sediments in shallow lakes throughout the DElta as people move across the tundra as being a usual event. Only one person volunteered an example of an off-shore explosion, and that was Charles Hary of Alakanuk who stated as a secondary source he had been told by a village elder of that elder witnesses a gas eruption while seal hunting by foot many years ago. Hary volunteered himself that villages frequently report area of disruption in ice seets offshore that have frozen over, with small rubble piles surrounding the refroze hole, indicative of ice being removed from the sheet by some means. Hary mentioned that villages thought that these were gas eruptions.

LIQUEFACTION OF SEDIMENTS

Specific village references to this event associated with sediment with little tensil strenght was not evident. Based on the villager experience however of witnessing sand bars being removed in post storm surges, and channels being built with short periods of time, villagers believe that liquefaction could also involve sediments removal due to wind and wave action in the shallow subtidal areas adjacent to the mouth, and through the action of ice pileups, and ice naging against any object either above or below the water or sediment line. The villages stated that this area is a data gap.

SHEET FLOW

Villagers indirectly commented on this event by stating what they had seen in both mud and sand when objects are stuck in them. The scouring and consolidation of sediments in both sand and mud made them believe that the event could be even worse under the ocean. They mentioned rotting animals that sink as examples. When an animal is killed like a seal is killed during the summer months off the Yukon Delta, and it it killed when shot, it will sink. The animal is not expected to rise when it begins to bloat with decay in the same location for the currents are so strong against the sediment floor. If the same animal were struck in the spring or fall, when its insulating layers are thicker, the people say that it will come up not in the same place, but within sightof the place it went down. Only a heavy animal like a walrus, if shot on the north face of the DElta near North Mouth will come up in the same place it went down. The villagers say that this is because of the weaker currents. Walrus are not usual in the south and middle mouth areas of the Yukon Delta to draw similar illustrations. The villagers state that the sea bed currents inbetween the South and Middle mouths is much greater then the north mouth area based on animal carcass movements.

PERMAFROST

Andrew Hamilton of Emmonak whose testimony was reference by Alfred Redfox at the Emmonak Hearing mention thatafter a large storm, the tide went far out, and the men who trapped near the coastline on small hill, searched the beachfront. They walked out following the tideline, and they found permafrost beneath the mud with their sticks. In his personal communication, he could not say how far out they went, but he did say that the permafrost was there for they pulled up the mud and found the frost. This is an area requiring more examination for the DEIS mentions that permafrost is not a coastline or submarine sediment issue, and could potentially cause facility siting and pipeline siting problems.

CLIMATE AND SETTING

Axel Johnson in a personal communication mentioned that in 1935, he flew from

Emmonak to Nome in a bi-plane. As they crossed Norton Sound, during this very cold year, the area right in the center of Norton Sound that has been identified in the DEIS as a current eddy area that is normally open sver year, was frozen over. Axel stated that the pilot, who made this trip frequently every year, and had flown that flight for many years preceeding and after that event told him that was the only year he had ever seen that portion of the Norton Sound covered with ice.

A second point concerning Page 36 reference to the Aleutian Low involvss the period of time when field ressarch was being preformed in support of the OCSEAP program. From 1977 to 1980, unusual southerly winds dominated ths Bering Sea U.S. coastline. Mean T° for weather reporting station during the winter wers usually 10°F warmer then annual mean T°, ice formation, thickness, and break-up and wind patterne both regionally and locally. The common viewpoint of villagers and residents of the region who have reviewed ths DEIS is that the Government data base has been developed over too short a period of time, did not includs enough reporting stations, and the unusual weather conditions occuring during that time frame if taken as the etandard for meteorological annual events in Norton Sound could significantly skewer all DEIS conjectues, analysse, and planning for potential oil spills(reference. During ths 1976, when significant fires occured in the upper Seward Penninsula and ths Kotzebue region, the dominant northerly summer wind blew the smoke throughout the Delta, causing poor visibility and a significant increase in health problems. Ths area of the Delta went through a long period of TB, and those still surviving carry the lung scaring that makes brsathing particulates very difficult. Sus Unin(personal communication) the Clinic Nurse in Chevak remarked that many people were told to etay inside during those days to avoid ths particulate matter in the air, and for 1 day, the Chevak airfield was closed by the pilote due to the dense particulate matter in ths air).

A third point is that no reporting statione(Cape Romanzoff) or commercial airlines daily weether rsports from villags fisld agents are included in data analyses of southern Norton Sound. BLM/OCS ehould research thsse sourcee for support or variation from reported norms of northern Norton Sound reporting stations.

Point #4 in regard to gensral circulation affecte villagere thinking about fieh harveet being indicative of net current movement, and Yukon River discharge. Villsgee are located on the coastline in convenient staging areas for subsietence

on file with ths Alesks Department of Fish and Game/ Bethel from 77-80)in Hooper Bay occured aftsr a three day change in tha eoutherly winds from south to west and then only chum salmon would be found. Chum is expected to be like pinks, eseily fooled by minor changse in fresh water discharge patterns. Mann, Kapanak, Bunyan, Simon(personel communicstion) of Hooper Bay ares confirmed that in years of peak abundance, chum salmon and pink are found in grest abundance in the mud sloughs of the tidal lowlands in the Hooper Bay-Chevak ares, whers their eggs are immediately captured by the soft silt on the mud bottoms, and suffocated. King salmon, red salmon and silver salmon are vsry rarely found in the mud sloughs sven in years of pesk abundance.

A fifth point made by Fish and Game biologists is that villagers have told them of freak yeare when weather conditions allowed them to be far offehore ssal hunting on near shore pack ice and flaw lead/shorefast arese that the salmon smolt have been scene in bellies of beluga whalee in the late spring. In addition, the larvae Year 0 clase of herring floating with ths currente of tha nesr shore northerly flow from Brietol Bay, Nelson Island, Cape Romanzoff movs in the same direction as smolt, through the lsase area in early June, re-enforcing the gsnerally northward flow, but further emphasising the long term impact of oil development from acute and chronic dischargs in ths lsasing areae to ths fieheries resources most heavily depended on by ths subsistsnce and commercial fisheries of the villages of ths Yukon Delta and adjacent coastal arsae.

On Page 39, reference is mads to a decrease by 60-80% of nsarshore traneport rates under the ice. Statements by witnessee in Emmonak referred to iteme dropped in ths flaw-lead area and the near shore pack ics associated with the lead moving faster then a man could walk . The fact that no experience sxists should underscore the necessity for furthsr studiss on movement laterally and vertically under the ics to prepare for oil transport and clean-up.

Again on page 39, refersnce ie mads during periods of ice cover, of oil movement under the ice. This paragraph does not mention the porous naturs of annual ealt water ice which makes it appropriate for significant entrainment, and eedimsnt annealing oil particulars and moving downward in ths water columm. In addition, the assumptions made on net transport are due to meteorlogical best guess efforts and will often be contradicted by local atmosphsric svents. In that no ground truths by OCSEAP have been made on all ice aesumptions, this entire paragraph should bs stricken, and rewritten.

In regard to tides on pags 39, ths variation in tides is not rsflscted for the Yukon Delta. From August 22 through Septsmber 14, ths tides were vsry slack and high high tide was lower then the summer low high tids mean. Similar situations occur throughout ths year.

harvest areas. The major source of fishprotein is salmon, a fish species that generally approaches its spawning stream by following the interface between the salt water and the fresh water discharge of their parent stream. In the case of the Yukon River, the villagse south of the Yukon Delta are all salmon fishing villages. Hoopsr Bay and Chevak fish in the channel of Hooper Bay either stationing their nets in the north end of the channel at the very end of the channels entrance into Hooper Bay proper on the incomingtide, or at the very tip of the southern sandbar, called Nuuvuq adjacent to the villags of Hooper Bay in the southwestern portion of ths Bay. Salmon are not caught in the eastern portion of the Bay until late in the run when local spawning color stocks appear, or during sarly June when heavy western or northwestern winds bring fish in repeatedly to the Hooper Bay. Scammon Bay catches its fish in either the Kgun River, or in Black River. Ths major fish caught is chum salmon. Unlike kings, silver, and reds, chum and pinks smolt re-enter the ocean in the first months of life, whereas kings, reds, and silvers spend 1 or 2 years in their parent stream. Villagers and fish biologists agree that it is harder to fool by local current and wind kings silvers and reds into entering streams other then their parent stream. With this idsa in mind, from 1977 through 1980, catching any type of fish in Hooper Bay was difficult, until three days after a western wind finally replaced the southsrn wind dominating the region's summers in those years. Coincidentally, record catchss of king salmon occured in the northern mouth of the Yukon River, while vsry poor catchss were recorded inthe south and middle mouths from 77-80. The reason believed by State Fish and Game biologists and confirmed by satellite surveillance is that the dominating southerly breezes of 77-80 drove the fresh-water plume of the Yukon River in northernly direction towards Nome, and that tagging of migrating king salmon near Nome in 1978 determined that a majority of the returned tage were from ths mouth of the Yukon River. Villagers and State Fish and Game concur that the king salmon followed the fresh water discharge of the Yukon River into Norton Sound during those years, explaining ths poor runs in Hooper Bay, Kgun River, Black Rivsr, and the south and middle mouthsof the Yukon River in ths years of 77-80. This also explains why fish harvest by both the commercial snd subsistence fishermen in these areas was so poor, for with the plume going northwards into Norton Sound, fieh that would normally followed the plume that is pushed south and west slong the Yukon Delta coastline towards Nelson Island did not occur. Fish, and the coastal villages that have settled there many milleniums to harvest thsss fieh and depend on the northerly summer wind currentsto bring the fish into range of their poorly equipped fisherise did not occur. The only period of time when chum salmon were harveeted in abundancs(Sparck subsistence harvest records

The last iesus on Meterorological Conditions and physical oceanography refere to storm surges. This issus is covered more extensively in prsceeding pagee. The brsviety of ths treatment in ths DEIS underecoree the complete lack of information available to govsrnment planners at this time. For theee reasons alone, the BLM should begin immediately to plan for long range studies to fill the numerous and significant data gsps in rsgard to the Yukon Delta, and the involvement of ths estuary and tidal lowlands of the DElta with potential damage from off-ehors operstions. Until scientists can begin to document ths unique environmental conditione themselvss, BLM can only suppose its truths, denying the statements of villagere as being non-scientific, and therefore without foundation, and threatsning the international significance of the Yukon Delta with ill-founded theories thet ars ueelees when neceseity brought on by both acuts and chronic damage to the Delta requires hard, reliable dsta to protsct its long term values.

One more point should be made with respect to the DEIS's treatment of environmental hazards. The Environmental Hazards in Norton Sound Proposed OCS Lease Sale 57, Table III.A.1.-1, "is a judgemental and subjective table which was produced by acclaimation at the Norton Sound synthesis meeting; it does not represent a carefully-balanced quantitative statement of environmental hazards and specific engineering solutions available to accomodate the environmental hazards." (Personal communication from Dr. W.M. Sackinger, University of Alaska at Fairbanks, to Ken Hamm, September 15, 1981.) The table should be redone to reflect this fact.

XVI. THE SUBSISTENCE ISSUES RAISED IN THE DEIS NEED ADDITIONAL DISCUSSION.

III. B. 3.
SUBSISTENCE PATTERNS

In the majority of instances, the DEIS discussion of subsistence patterns is accurate, though too brief. Many of the long range affects to be felt by the imposition of oil and gas development on the sensitive environment and subsistence way of life of the villages of Norton Sound is not discussed.

Principally, the Norton Sound oil and gas sale has the potential for seriously affecting the marine resources that ½ of the Alaskan Native villages of the State of Alaska depend on(the 57 villages of the Yukon- Kuskokwim Delta, the 42 upriver Yukon River villages of the Tanana Chiefs area, and 22 villages of the Kawerak/Bering Straits area). In additon, the net movement of nutrient from the discharge of the Yukon River fuels the primary producers of the northern Bering Sea, and thereby significantly affects the villages of the Kotzebue Sound and North Slope Borough of northern Alaska. As displayed in the Census District materials, the economies of these remote rural villages can ill afford habitat disruptions that would alter wildlife movements that are so vital for their welfare and nutrition.

At the Emmonak Hearing, Theresa eoples of Stebbins reported that the air gun booms from the Husky III seismic exploration ship as it went west of Stuart Island chased the nesting shorebirds from the west side of the island towards the east and northeastern rookeries. In addition, the harvest of marine mammal, normally excellent in this area during the time of year of the seismic testing, was dismal, and continued to be that way againet the history of successful harvest patterns till the time of the hearing. Peoples further testified that neither her village, nor other villages, nor regional organizations with permit and A-95 clearinghouse authority, had been made aware of the proposed seismic activity in advance of the issuance of the permits, and the testing taking place. Had the villages or their organizations which are familiar with wildlife movement, and the reliance on this purposeful migration been made aware of the permits, they would have argued against the discharges taking place in known habitat migration and nesting areas, and the problems of summer, 1981 could have been avoided.

The involvement of local people in not only the take and conservation of wildlife, but how Government goes about its business of balancing natural value with National ecnomic needs was taken care of in the Alaska National Interest Lands Conservation Act of 1980. Several sections of ANILCA are not cited in the DEIS, most notable Title III, Refuges in which protection of habitat for international

Treaty committments, and subsistence are made purposes for the establishment of the Yukon DElta National Wildlife Refuge(see Section 7 of AVCP comments).

In addition, Title VIII of ANILCA, the title dealing with Subsistence, calls for a massive overhaul of the regulatory system of Federal and State wildlife habitat and allocation decision making to allow rural villages to more fuller involve themselves with the local details that only villagers know best. One additional section, 810, calls upon the Federal Government o significatnly break with past tradition, and to involve the villages in planned federal permitting for other then land and wildlife conservation within rural federal lands in Alaska. The Federal lead agencies for thelands involved must hold a pre-permit hearing in village(s) whose subsistence activities could be threatened by the proposed Federal permitting action, and in the decision on the permitting, the affect on subsistence must be taken into consideration, and Congress suggests that if alternate lands without similar subsistence interferences can be located that a permit be issued for those alternate lands.

What is cited in the DEIS is a listing of Titles 803 and 804 which deecribe the definition of subsistence "uses", and the allocation system if wildlife populations fall off, and all cannot equally partake of rural animals. The basic issue of conservation of a resource and a unique way of life associated with the lifestyle is not adquately discussed in the DEIS.

The econony of subsistence and the village social and physical system is not adaquately addressed. In AVCP's comments, Enclosure #7, "The Other Village, Enclosure #8, "The Other Village Revisited", and Enclosure #9, "Directione of Growth", all by the staff of Nunam Kitlutsisti, the issue of subsistence as a vital part of the way of life of rural Alaskan villages, and the economy of scale involved in remote rural villages is more thoroughly discussed. Briefly, the EIS addresses the iesue of spending earned capitol to promote subsistence activities, but it does not discuss how modification of the habitat or alteration in migration cycles of abundance of population would negatively affect the remote Aleskan village within the sphere of influence of Norton Sound Sale #57.

The use of the word"lifestyle" to describe subeistence in rural villages is inappropriate. Lifestyle connotes a choice of life, as if the remote villager had hie choice of the cash import-export economy, and subsistence, and choice for his own convenience the later, where as the demographic and economic data already presented in the DEIS graphicelly reveals that this is not the way rural life in the villages is. Subsistence in the rural villages is "a way of life" for it is the only choice available to the remote villages of the region.

In regard to the statements on page 50, concerning the subsistence harvest of the Yukon Delta villages, AVCP Comments Enclosure #14, the 1974 and 1976 Subsistence Harvest Surveys are a more accurate reflection of subsistence take per household in the villages. The 16.2 million pounds of harvest in 1976 has been substantiated by independent studies by Wolfe(1978, Kotlik, YUkon DElta, 1981), Subsistence Section, Alaska Department of Fish and Game, 1981, and the Federal Fish and Widlife Service Spring Subsistence Migratory Bird Take by Yukon-Kuskokwim Delta villages(1980,1981)

In regard to Village Livilihood on Page 51, the same note made above "way of life" rather then lifestyle should apply. The discussion however centers on economic catalogues for the Nome Census District also. The Association of Village Council Presidente Economic Development Administration OEDP program and the WATTS Study both developed economic data on Yukon Delta villages, neither of which is used in the DEIS. It is important to broaden the scope of the village outlook to relate all villages within the ephere of influence of Norton Sound #57. The last appendix to AVCP Enclosure #6, "Directions of Growth" reveals the listing of general imported energy cost to 24 selected families in Chevak from 1974 to the 1980. The outline compares the amount of gross family dollars spent on energy(does not include blazo gas for camp stove cooking in the village households) as a per centage per year. Even though modifications occured in village use of energy, the houses were kept colder in 1980 for people could not afford the costs, the net development that the elevation of energy prices caused an even greater per centage of gross family income to be spent on fuel oil. Nowhere in the DEIS does the report discuss the inflationary effects of massive movements of men and equipment into the Norton Sound region to the inflationary spiral and ability to obtain imported goods to the village household, as described in AVCP Enclosures #7 and #8. AVCP Enclosure #20, a letter from Harold Napoleon, President of AVCP, to the Alaska Oil and Gas Aeeociation lists nine points considered critical by villagers in public meetings about potential oil development that the Industry should answer in any public relations effort. Iesues #3, the effect of industry use of local traneportation services, and infrastructure, and its relation to cost of living indexs for villagers on fixed and already low incomes when compared to national incomes. The villages wanted to know how the Industry was going to insulate the villages from these effects, when already Industry has stated that there will be no jobs during the exploration phase of any consequence to village audiences, and no sharing of revenues for leases with local impacted communitiee.

III. D. Economic Considerations

The basic assumption of this section is that no other community outside of Nome in the sphere of influence of Norton Sale #57 need be discuseed, for impacts will be peripheral. This is nonsense, for as is shown in AVCP Enclosure #7, #8("Other Village") each bump in Alaska "boom and bust" ecnomic development cycle has rippling effects in the remote rural communities. These communities are at the end of the economic distribution and development chain, and shocks to their statue quo are magnified by largs scale remots economic developments. Use of airport and transportation networks by villagers in competition with bulk equipment and large manpower transportation needs of the development industries will pale the villags economy, putting them at a competative disadvantage for space and economies with common carriers, As displayed in AVCP Enclosure #20. Enclosure #9, "Directions of Growth"'s appendix reveals the significant growth in imported energy costs and the trials and tribulations of the transport deliver system in rural Alaska during the far away piepline and post-pipeline days, and enclosure #20 discusses the real concerns of the villages of the Yukon Delta, remote from Nome, for Industry influences their standard of living, abaility to get imported goods, and public carrier tariff echedules.

We concur with the opinion of the DEIS authors that currently, commercial fisheries for highly valued salmon is the most significant economic influence in the area, but caution the writers to further examine hard rock mineral development, oil and gas development and energy facility citing for transhipment in the non-renewable fields, and herring, snail, Saffron cod, caplein, and yellow fin sole Norton Sound as potential alternate local fisheries, and if developed, equally the salmon economy of the region. Additionally, Congress has recently modified the Marine mammal Protection Act of 1972, that allows the State Of Alaska, once regaining management of the ten Alaskan coastal species, and satisfying recruitment and subsistence needs from these mammals, and after a public hearing and findinge in this manner, to make available to Native Alaskans the surplus commercial use of these resources for guiding, meat reduction, sale of skins, and ivory in the future.

Additionally, simple figures by the State Department of Health and Social Services reveal that if Bethel and its family units are removed from the Bethel and Wade-Hampton Census Districts, that nearly one out of every two village families receives transfer and entitlement payments from the

State of Alaska, and if Bethel is included, the figure lowers to one out of every three families. It is important to consider this issue when addressing the matter of State snd Federal budget cuts affecting remote, Alaskan communities It is important for theze reasons to address the issue of subsistence as a regional economic issue in this section also. Subsistence cannot be bifurgated into a socio-cultural issue, for as revealed in Enclosure #10, AVCP, the 1974-76, Subsistence Harvest Survey, over 16 million pounds of resource have been harvested by AVCP area area villages alone, that are dependant on the Norton Sound marine system. With a decline in economic from government coffers, the villages in planning their future existence will require subsistence even more to get through the year, and the economic necessity of planning for this harvest will involve diminishes man-made events that could alter habitat, or the migration timing, routing, or abundanceof wildlife species critical for subsistence village harvest.

On Page 80, only the commercial fisheries of Norton Sound are discussed This we believe is s gross oversight by BLM/OCS, and request that the full fisheries economy of the Norton Sound community: the Yukon river in its entirety be included, for the smolt of the Yukon River, kings, silvers, stay in the lease trsct area during the summer months, as do the Year 0 class free floating herring larvae of Western Alasks. We also urge the inclusion of theherring fisheries which will be impacted for the long term by oil and gas development, in that immature and larvae forms of these fish are more sensitive to spills and oil within the water columm then adult spawners. In terms of bslancing by the Secretary of the Interior, it is very important that the full picture of the economic trade-offs in regard to the exieting cash economy(commercial fishing) and subsistence economy be made plain in the Secretarial Issues Document which will be drawn from the FEIS.

Finally, in the last paragraph on Page 135, We object to the statement attributed to Nunam Kitlutsisti seying that cash in hand "may encourage less careful hunting practices..". The reference here is to boat crews captained by local hunting leaders with fellow villagers as crews. This type of hunting pattern does not exist in the subsistence villages served by Nunam Kitlutsisti, where individual small boats, and single, or two member hunting parties are the norm. Furthermore, in articles submitted under AVCP comments, Enclosures #6, #17, #18, the concern of NK ie to show that the management of time and money in the modern villege ie to emphesis hunting success, and e return of volume for funds spent on transportation, the very antitheseis to this statement. Nunam Kitlutsisti requeste the deletion of this paragraph in the DEIS, or its attribution to its real source. Nunam Kitlutsisti does not believe that this statement is truthful and doubts if this situation exists in rural Alaska. Under no circumstances should this statement appear in the FEIS under the name of Nunam Kitlutsisti.

On Page 136, reference is made to a decrease in sharing if stress is placed on the natural system depriving adaquate subeistence nutirition to coastal villages. It is the experience of the Board of Nunam Kitlutsisti, its staff, and the villagers of the Yukon Delta who had this statement read to them that this is exactly the opposite of the truth. In hard times, the sharing becomes greater to let each family eurvive, and thebest hunters for the particular resource are entrusted with community goals of harvest. The task of harvest is carefully divided within a village, or between villages, and sharing of tha harvest takes place.

We disagree with the conclusion on page 136, which does not mention the Yukon Delta villages as being potentially impacted through subsistence by the lease sale offering. As described throughout the DEIS by AVCP, the shortsighted approach to focus on Nome doee a tremendous disservice to the remainder of the Norton Sound villages who will share the difficulties, and due to sensitivity of the estuaries and tidal meadows of the Yukon Delta, this area through sediment loading with oil debris will face long term consequences that only some areas of the remainder of the Norton Sound will face.

IV.D. 1. c.

We believe that the statement here, although agreed with, should be expanded to explain what the benefits would be, and how they would be achieved with a delay.

AFFFECTS ON SUBSISTENCE FROM VARIOUS LEASING ALTERNATIVES

III. B. 1. c. SubsistencePatterns

The first eentence is a mistake on page 131, for the definition cited here is the Federal definition of "subsistence uses". Second, the first paragraph faile to mention the essential economic component of subsistence in the village family and village way of life as an important ingredient in any discussion on impacts that could lead to habitat or wildlife alterations.

The reference to Chart IV.B.1.c.-3 is incorrect. In the report by Ellana, Subsistence Section, Alaska Department of Fish and Game her listing ofwildlife species was only relevent to the fact that th se species were in the trsct leaşe area; she did not discuss the sensitivity of these species in different times of the year to oil. The indexing to oil sensitivity was added by persons unknown. Nowhere in the written statement referring to chart on page 132 the vary important "qualification in small print st the bottom of Chart IV.B.1.c.-3, that is the assessment on the chart is completely subjective, and is without field evaluation by competent wildlife scientists in Norton Sound.

On Page 133, the chart describing the habitat affects of spills within 10 days is also incorrect, in that it was based on the trajectory data that is suspect due to the few reporting stations, and the meterological data baseline of 1977-80 which coincided within unusual southern winds dominated the coastline throughout those years. In addition, this material is based solely on Oil Industry conclusion, and is without independent Government eponsored verification.

On Page 134, the discuseion of involving oil spill clean-up program with local villages is good, but inappropriate given the fact that Industry does not the current technology to handle spills in the winds and current/ice of Norton Sound. Participation by villages watching their "gardens" die is paternalism, and not effective spill management.

On PaGE 135, the discussion of Socioculture impacts does not contain the the problem associated with disturbances to the wildlife potential of the region affecting the significance of cash to village economies, and that plus habitat disruptions could drive the villages not only to more cash dependence, but out of the villages to urban centers where imported goods are more readily available, leading to a new range of sociocultural difficultiee.

XVII. THE SOCIOCULTURAL ISSUES RAISED IN THE DEIS NEED ADDITIONAL DISCUSSION, ESPECIALLY WITH RESPECT TO IMPACTS UPON THE YUKON DELTA VILLAGES.

As displayed earlier in parts IX and X of our comments, there exists a greater possiblity than the DEIS admits that onshore supply, support, and storage bases will be built in the Yukon Delta region. The analysis on the potential impacts which the proposal might have on sociocultural systems, however, follows the assumption that onshore development would occur in the Nome area. Consequently, the issue of potential sociocultural impacts in the Yukon Delta region is not adequately discussed. This section should be revised so that sociocultural impacts in the Yukon Delta are analyzed under a scenario in which development occurs in the Yukon delta region.

Discussion of Positive and Negative Indicators of Reponse to Change, pages 130-31:

We agree that the negative indices of change discussed on page 130 would occur under the proposal; however, as stated above, we feel that this information should also be applied to a Yukon delta reas development scenario.

The Positive indices of change we expect to be minimal at best. Few jobs will be available for local residents, who generally lack the technical skills necessary to become employed by the oil industry.

Industry financial contribution to the community may in fact turn out to be, over the long term, an indice of negative change, rather than positive change. As Enclosures # 16, # 17, and # 18 point out, capital projects in the villages often cause more harm than good. Furthermore, after development is over the people in the villages will still be living there; yet oil industry money which had previously supported capital projects will be withdrawn.

Improved local entertainment and recreational opportunities is also a two-edged sword. New forms of these opportunities will, in effect, take village residents away from traditional activities, destroying their culture in the process.

The conclusion on page 131 does not follow from the previous discussion. The conclusion should read instead that the impacts of the proposal on the sociocultural resources is considered to be severe, not moderate. We expect this to be true throughout all villages in the vicinity of the lease area, not just the community of Nome. As previously shown, develcpment might occur in the Yukon delta region, rather than Nome.

ADDITIONAL ENVIRONMENTAL MITIGATING MEASURES ARE CALLED FOR BEYOND THOSE LISTED IN THE DRAFT ENVIRONMENTAL IMPACT STATEMENT, AND THE MEASURES LISTED IN THE DEIS NEED TO BE STRENGTHENED.

As discussed in Part I of our comments, the position of AVCP is that a five year delay in the proposed Norton Basin Lease Sale is appropriate given the unpreparedness of the communities in the Norton Sound region, the oil industry, and the BLM environmental studies program. However, AVCP does recognize that the sale might occur as scheduled sometime during 1982 despite our opposition. Consequently, AVCP has spent considerable time on the mitigating measures portion of the DEIS, analyzing the adequacy of the proposed mitigating measures as well as suggesting proposed additional mitigating measures. It should be noted that many of the environmental mitigating measures which we are proposing in this section of our comments were actually first raised during the scoping process but were not included in the DEIS.

We believe thst the final EIS should thoroughly assess the additional environmental mitigating measures which are discussed here, and should thoroughly analyze the issues which we feel they will address. We wish to emphasize that the concepts which we discuss in this section are more important that the exact wordking of the proposals. It is the concepts, rather than the wording, that needs to be thoroughly discussed and analyzed.

The following pages cover our concerns about environmental mitigating measures only. Socio-cultural mitigating measures will be discussed in the following section.

This stipulation should apply to all tracts in the lease area. Serious problems exist with industry's ability to drill a relief well or effectively contain contain or clean-up an oilspill in Norton Sound--especially in the winter. These problems clearly indicate the need for this area-wide measure.

For example, it is generally agreed that exploration of the lease are will be carried out in Norton Sound by jack-up rigs (DEIS at 101). Because jack-up rigs are not ice resistant, exploration will most likely be confined to the open water season (roughly late May through mid-to-late October)*. This presents a serious problem regarding relief well drilling in the event of a blowout. A blowout is most likely to occur near the end of a drilling program when the well is deep, where pressures are greatest, and oil is most likely to be encountered. In Norton Sound, if a blowout were to occur late in the drilling season -- say October 30 -- there is a strong likelihood that there may not be enough time to drill a relief well before ice mores into the lease area.

A recent estimate of relief well drilling time can be found by looking at Exxon's Exploration and SPCC plans for Beaufort Sea OCS-Y-0191 #1. On page 76, Exxon summarizes the time required to drill a relief well in this area. Assuming "trouble free operations, without extraordinary problems", the shortest time frame is 14 weeks (98 days). Thirty-one days of this are spent building a gravel pad and trucking the rig onto location -- activities which would not be required in Norton Sound assuming the use of jack-up rigs. Sixty-seven days are needed to drill the relief well and shut-in the blowout.

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* The exception would be the use of gravel islands in the shallow waters located mostly in the southern part of the lease area. However, the immediate use of gravel islands appears to be unlikely because of a lack of easily accessible gravel supplies.

1. Orientation Program.

We support the concept of the orientation program so long as it is sensitive to local conditions and the goals of local residents. In order to ensure this, we recommend that the program be designed in cooperation with local representatives from the Norton Sound area. In addition, we must point out that the DEIS placestoo much emphasis on the effectiveness of this measure as a technique for preventing spills, reducing the impacts of chronic pollutant discharges, etc. The orientation program is described as a major mitigative technique for minimizing social impacts as well as impacts to birds, salmon, herring, crab, bottomfish, and marine mammals. Such expectations are obviously unrealistic. This measure simply is not an adequate substitute for explicit stipulations which address specific problems. The DEIS should make the limitations of this measure clear.

2. Transportation of Hydrocarbon Products.

This measure, has become a standard lease stipulation for OCS activities. However, language should be added which would ensure that the free passage of migratory birds, fish or marine mammals. In the event that causeways are used, long continuous-fill causeways should be prohibited.

3. Seasonal Drilling Restriction

On page 16 the DEIS proposes a seasonal drilling restriction which would allow exploration to occur only through the period of June 1 through October 30. Unfortunately, the effectiveness of this measure is significantly impaired because it only applies to 93 tracts in the extreme southwestern portion of the lease area.

In the case of our example -- i.e., an October 30 blowout in Norton Sound -- this would put the relief well operation into late December.*

The significance of this is self-evident. Freeze-up usually begins in Norton Sound in early November. Therefore a jack-up rig would have to be out of the area long before a relief well could be completed. This means that the blowout could flow uncontrolled for 8-9 months (untill the following summer) before relief well operations could commence.

GRAVEL ISLANDS

Similar problems exist if gravel islands are used in Norton Sound. If a blowout occurs on a gravel island, a relief well may have to be drilled. If this were to occur during the open water season, a jack-up might be used to drill the well, but this would depend on the time of yesr, water depth, rig availability, etc.

If a jack-up were unavailable, or if the blowout occurred during the winter ice season, then the relief well would most likely be drilled from a gravel island. In this case, Exxon's OCS-Y-0191 #1 plan gives an example of what to expect, although there are some important exceptions.

First, it is generally accepted that relief wells for gravel island blowouts will require constructing an additional gravel island adjacent to the blowout. This is at least partly due to industry's unwillingness to construct gravel islands large enough to accomodate

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* This does not take into account the time it will take to locate a rig and move it to the relief well site. It is assumed that all available rigs will be drilling wells, and that a certain amount of time will be consumed by shutting down and moving the rig. This could add more delay.

both the exploratory well and a relief well if necessary. Construction of the additional gravel island will, of course, take time. In the case of the Exxon well in the Beaufort, this was 21 days.

For Norton Sound this time frame is probably too short. The Exxon well is adjacent to the Prudhoe Bay complex. The well is relatively close inshore, and the operator has ready access to an impressive inventory of heavy equipment, a well developed gravel supply, and an extensive road system for moving equipment and materials. This is not the case in Norton Sound. Most of the lease area is relatively far offshore, equipment will be less readily available, gravel will probably be in shorter supply, and transport times will be greater due to distance and the lack of infrastructure.

Furthermore, it should be remembered that the Exxon well is in the very stable landfast ice behind the barrier islands. Most of the Norton Sound lease area is outside the landfast ice zone. The dynamic conditions of Norton Sound pack ice may effectively preclude any gravel island construction until the following open water season when barges could transport the gravel. In this case, the blowout could also flow for several months before being brought under control.

In either case (i.e., jack-up or gravel island) an October 30 cutoff for all downhole activities would be an effective mitigating measure. Downhole testing would have to be completed prior to October 30, and drilling activities would take place even earlier in the drilling season. Thus, there would be a much greater likelihood of shutting down a blowout if one were to occur.

A second consideration involves oilspill cleanup. Oilspill containment and clean-up in Norton Sound is going to be a difficult and often impossible task. For the open water periods, most of the

equipment presently available is effectively limited to operations in seas of a maximum of about 6 feet in currents of about 1-2 knots. Recent modifications may have expanded this capability somehwhat (to 8 ft. seas), but application of such equipment is largely untested. Under ideal conditions conventional clean-up equipment cannot provide much more than a 50% removal efficiency, yet conditions in Norton Sound frequently exceed the design limits mentioned above. As such, the estimates for open-water clean-up efficiency presented in Appendix K are unrealistic. *

Logistics will be another serious problem. Mobilization and deployment of oilspill containment and clean-up equipment will be difficult and time consuming. There are only three airstrips capable of accomodating large transport planes (Nome, Unalakleet, Moses Point), and only one port capable of unloading heavy cargo (Nome). If a spill occurred near the center of Norton Sound it would take a vessel out of Nome about 5-7 hours to reach the spill site. This does not include the time required to load gear and personnel. If a spill were to occur in the eastern or southern portion of the Sound, transport times could approach 10 to 14 hours.

Furthermore, if a large spill should occur, personnel and equipment (some coming from as far away as Anchorage and Seattle) would necessarily have to be unloaded in Nome or Unalakleet and be ferried to the spill site by small aircraft, helicopter, or small boat.

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* This is particularly true for areas such as the Yukon Delta where industry estimates .75% recovery rate. This optimism is in direct contradiction to the findings of the draft Norton Sound Synthesis Report. After reviewing the extensive spill transport mechanisms at work in the Delta, the report concluded the "clean-up of a spill in the delta area does not appear practical."

This will greatly increase the amount of time required to respond to a spill, especially if adverse weather conditions do not permit the use of such modes of transportation. Under such conditions it might require several days just to transport personnel and equipment. During the winter months, short days, cold temperatures, and the presence of sea ice may add additional delays.

Winter clean-up operations will be even more difficult. Sea ice is normally present in Norton Sound 6 to 8 months out of the year. The effectiveness of most open water containment equipment will be drastically limited once ice concentrations exceed 10 to 20 percent. Although oil removal operations could conceivably continue in the presence of brash or pancake ice, it is probable that the efficiency of clean-up operations will be greatly reduced. Also, safety factors under such conditions may render clean-up operations impossible.

With higher ice concentrations, spill containment and clean-up becomes even more hypothetical. Oilspill response scenarios presented for the Beaufort Sea by the Alaskan Beaufort Sea Response Body (ABSORB) describe clean-up operations aimed largely at spills in the shorefast ice zone. Shorefact ice in the Beaufort Sea is thick and reasonably stable. This permits the use of heavy equipment to construct containment structures such as snow berms or trenches, and for physical collection and removal of oil spilled on top of ice.* In Norton Sound, both the strength and extent of shorefast ice is very limited, with most of the lease area outside the shorefast zone.

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* The techniques described by ABSORB in their Oilspill Manual mainly address oil spilled on the ice. Spills under the ice, or in moving ice are still a serious problem.

Because of this, clean-up techniques such as those described by ABSORB for the Beaufort Sea will be impossible to use for much of Norton Sound.

Problems exist with the Winter response scenarios presented by industry in Appendix K as well. For example, the under ice oilspill scenario assumes that oil would concentrate under the broken ice pack. Personnel would drill holes and dig trenches in the ice to further concentrate the oil which would then be burned. According to industry, <u>in situ</u> burning coupled with "secondary recovery/ flushing techniques" (not discussed in the DEIS) would yield a 50% to 75% recovery rate.

Such assumptions are unreasonably optimistic. Evidence from the <u>Kurdistan</u> spill off Cape Breton (one of the few large spills observed in broken pack ice) indicates that the natural tendency for oil spilled in pack ice is towards dispersion and dilution. One of the primary dispersion processes was the grinding of oil in brash ice as a result of floe impact and movement. In the offshore pack, swell propagation caused a leisurely grinding motion which produced oil particles ranging from a few centimeters in diameter down to micron sizes.

A secondary process which also tended to disperse the oil occurred as a result of solar heating on snow/ice surfaces. The ice beneath blobs of oil would melt, causing the oil to be stretched and spread until surface tension effects intervened to produce micron sized oil particles. Individual particles showed no sign of strong adhesion to the ice, and in many cases became trapped as new ice formed over those particles which had become concentrated in melt pockets.

Due to this tendency towards dispersion burning would have been completely ineffective and was not attempted.

Research evidence also points to several mechanisms whereby oil would be incorporated into the ice pack. For example, oil migrating into open leads will be compressed to greater film thicknesses, and longitudinal flow along the leads will occur from areas of thick oil to unoiled portions of the leads. This process will continue until obstructions in the leads cause the oil to overflow onto the surrounding ice. Since the ice is in continual motion with leads progressively opening and closing, the oil could be pumped through a branching network of leads from the area originally contaminated to uncontaminated areas considerable distances from the spill site. This would cause further dispersion of the slick into the ice pack.

When leads close completely the ice on either side of the lead may be deformed into pressure ridges. Before the lead closes,. the bulk of the contained oil can be expected to spill over onto the surrounding ice. As the ridge then forms, the oiled ice will be broken up and incorporated into the ridge itself. In this manner oil may become entrapped in the ice thereby effectively preventing any immediate clean-up, and allowing the oil to be reintroduced into the marine environment at a later date when the ice subsequently melts.

Large scale transport of oil in ice is a very real possibility in the Bering Sea. Pease (1979) compares ice generation and transport in the Bering Sea to the mechanic operations of a "conveyor belt". Ice develops in the northern and coastal regions of the Bering Sea, subsequently advects in a south-southwesterly direction, melts along the southern margin of the ice pack, and is replaced by new incoming ice.

In this manner, the Bering Sea ice pack is believed to replace itself roughly eight times during the course of a winter. Thus, oil trapped within growing ice in Norton Sound could be transported and released several hundred miles away.

The implications of oil capture and transport are significant when the physical aspects associated with such events are considered. Oil trapped in ice does not weather substantially, instead it retains much of its original toxic components, which can then be later released as the ice disintegrates. Processes normally associated with weathering such as evaporation, dissolution and biodegradation may still occur, but will be extremely restricted. Thus, oil transported in this manner could affect important biological resources and habitats hundreds of miles from the spill source.

This presents a grave threat to the extensive marine bird and mammal populations which inhabit areas south of Norton Sound, especially the ice-edge front. A winter spill in Norton Sound could be transported to crucial overwintering areas for birds, seals, walrus, and bowhead whales. As break-up proceeded in the spring, this oil could concentrate in leads and other open water systems which are extremely important to migratory marine mannals and birds. This presents an unwattanted threat to internationally recognized biological resources. A seasonal drilling restriction would help to minimize this problem by reducing the possibility that a winter spill would occur.

4. Area of Special Concern.

This measure is intended to mitigate OCS impacts on the Yukon Delta. As it now reads, the protection this measure provides is inadequate. It does not address blow-outs, rig fires, or pipeline

breaks, all of which could result in levels of oil pollution much greater that those posed by storage or loading operations. This measure should be expanded to require extra precautions to prevent blow-outs, rig fires, pipeline breaks, etc. The measure should also include certain provisions outlined by the draft Norton Sound Synthesis report for mitigating OCS impacts on the Yukon Delta, including:

-- No support, loading, or transfer facilities on the delta or within 60 km. of its shore; and that

-- A storm surge model be developed and used to control OCS activities just as the hurricane warning system is used in the Gulf of Mexico;

The storm surge warning system should be developed, tested, and operative prior to production.

In addition, the "Information on Oilspill Contingency Plans" contained in the "Information to Lessees" section of the DEIS (pg. 20) should be incorporated into this stipulation, with a requirement for special oilspill continency measures to protect the Delta. This should include a requirement for a positive, in-the-field demonstration by industry that effective oilspill clean-up under the ice or on wet tundra.

5. Information on Bird and Marine Mammal Protection.

This measure is proposed to be included in the Information to Lessees. As such, it is mearly advisory in nature, providing little or no quarantee of compliance. In fact, as it now stands this measure may promote harrassment by identifying marine bird and mammal concentration areas. To avoid this, and to ensure protection of these resources, the substantive requirements of this measure should be incorporated into a lease stipulation. Enforcement could

be accomplished by informing the lessees in the Notice of Sale that failure to comply with this measure would constitute a breach of contract and could result in suspension of the lease.

6. Information on Subsistence Activities.

Similarly, the "Information on Subsistence Activities" provides little or no direct protection of subsistence resources or activities, and is not an adequate substitute for stipulations which do provide that protection. Subsistence resources can best be protected by incorporation efffective stipulations into the lease sale (such as the seasonal drilling restriction, special measures for oilspill clean-up, etc.). Subsistence activities can best be protected by incorporating a stipulation which prohibits undue interference with subsistence activities. As with No. 5 above, compliance could be encouraged by informing lessees that leases could be suspended if undue harrassment were to occur.

7. Additional Mitigation Measures.

The DEIS overlooks several important potential mitigation measures. All of these were proposed at various times during the Norton Sound scoping process. They are discussed below:

A. Test Structure. Prior to year-round drilling activities outside the landfast ice zone, a test structure should be required. The test structure should be of the type as those structures proposed for the year-round activity. The test structure should be in-place two years prior to allowing year-round drilling.

B. Relief Well Drilling. Prior to any drilling activity the industry should be required to show conclusive proof that they have the ability to expeditiously drill a relief well. For the open water drilling season, this

means before ice conditions render drilling unsafe. For year-round activities, this would include relief well drilling at any time of the year under any conditions found in the lease area. If the industry could not demonstrate this activity, then drilling permits should not be issued. For discussion purposes, an "expeditious" relief well action would be 45 days total.

C. Oilspill Clean-up. Prior to year-round drilling, industry must be required to conclusively demonstrate the ability to clean-up oilspills under all conditions found in the lease area -- particularly moving sea ice. Such a demonstration would include actual field tests of equipment and techniques. Currently, most of these are hypothetical techniques which have not been field tested.

D. Discharge of Drilling Muds. The discharge of drilling muds should not be allowed in waters of 10 meters or less in depth. The discharge of drilling muds and the chemical additives often used to combat specific drilling problems can be acutely toxic to fish and marine invertebrates. The most commonly used components of water-based muds are barite, caustic soda, bentonite clays, and lignosulfonates. Of these, soda and lignosulfonates are usually considered the most toxic. Ferrochrome lignosulfonate, a heavy metal compound, may be freed by chemical reactions when released into the marine environment, resulting in contamination of of surrounding waters and possible toxicity to aquatic orgamisms. Heavy metal contamination can affect living organisms or ecosystems by changing the species composition in the area where the effluent is

discharged, disrupting the biological systems of individual organisms, or accumulating in members of the food chain until the predators in higher trophic levels are affected (AFDG 1981). In drilling the Northon Sound COST well, chrome lignosulfonate in concentrations of 18,000-24,000 fluid parts per million were present in the mud mixture used (USGS, 1981).

Caustic soda is used primarily to reduce bacterial growth in drilling mud by maintaining a high PH (Dames & Moore, 1978). Studies have shown that caustic soda is lethal to various aquatic species in concentrations of 70 to 450 ppm. Falk and Lawrence (1973) recorded the LC50 for rainbow trout exposed to caustic soda at 105 ppm. Muds used in drilling the Norton Sound COST well contained caustic soda concentration mixtures of 600-5,000 fluid parts per million (USGS, 1981).

In addition, drilling muds may contain other chemicals such as emulsifiers, viscosifiers, thinners, preservatives, etc. Most of these chemicals are used to address specific drilling problems and are often associated with deep wells. Many of these compounds are highly toxic at concentractions as low as .06 ppm. for certain bactericides. Trivalent chromium salts which are generally used concurrently with XC polymers in drilling fluids are toxic to aquatic life at 0.3-1 ppm. Hexavalent chromium, a major source of aquatic toxicity in drilling fluids, can occur in concentrations of up to 450 ppm in mud, and is harmful to aquatic biological systems at concentrations of 0.1 to 0.4 ppm (Land, 1974 cited in AFDG 1981).

In Norton Sound, habitats which could be particularly sensitive to drilling muds include herring spawning and over-wintering areas, eelgrass and kelp beds, and nearshore feeding and rearing

areas for juvenile salmon. In addition, because of poor circulation, nearshore waters inside the 10 meter depth contour are considered particularly sensitive.

Based on these considerations, we strongly recommend that a stipulation be placed on the lease sale which prohibits discharge of drilling muds anywhere within the 10 meter depth contour. We also recommend that the stipulation require that mud disposal areas must be designed and located in a manner which will prevent drilling muds from being carried or leached into the highly sensitive habitats mentioned above.

E. Discharge of Formation Waters.

The discharge of formation waters from offshore platforms or onshore treatment facilities could also seriously affect fish and marine invertebrates. Formation waters may contain up to 50 ppm of oil as small droplets and up to 35 ppm of dissolved hydrocarbons, primarily aromatic fractions (Koons et al., 1977). They may also contain toxic quantities of heavy metals, such as vanadium and mercury, and hydrogen sulfide, a poisonous gas. All formation waters are anoxic, and the concentrations of dissolved salts may vary greatly from those of the surrounding waters.

Organisms react in various ways to these different contaminants. Soluble hydrocarbons, heavy metals and hydrogen sulfide, even at low concentrations, are known to be toxic to marine life. Soluble hydrocarbons can have serious effects on larval fish and shellfish at very low concentrations (1.0 ppm or less). Non-hydrocarbon constituents of formation waters can also cause various adverse effects on fish and other marine life. For example, ammonia, a constituent of formation water, produces gill enlargement in fingerling king salmon. Mercury, another heavy metal found in formation water has been shown

to concentrate in fish in excess of 10,000 times the amount present in surrounding water. The heavy metal lead, in concentrations of 0.3 ug/l impaired the reproduction of zooplankton, particularly, Daphnia major (NERBC 1976).

In addition the pollutants contained in formation waters may present a serious long-term, chronic threat to Norton Sound. For example, the oil in formation waters can adhere to sediment particles in the water column and settle to the bottom causing contamination of the bottom substrate. When accumulations reach a sufficient level, destruction of bottom communities occur. This suggests that although the concentration of oil in water may be low, oil may be accumulating in bottom sediments over a long period of time.

Similar problems may exist for heavy metals and other pollutants.

Because of the potential for serious long term impacts the discharge of formation waters should be prohibited in the entire lease area by stipulation.

8. Norton Sound Task Force.

In addition to the above stipulations, a Norton Sound Task Force should be established for the purposes of monitoring exploration and development activities in the lease area. The Task Force should include agency representatives from the Bureau of Land Management, the U.S. Geological Survey the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and two representatives from the Norton Sound area. The two local representatives should consist of one person from each of the two Norton Sound subregions -- i.e., one Yukon Delta representative and one from the Bering Strait region.

The purpose of the Task Force would be to monitor post-

lease activities. For example, the Task Force would review exploration and development plans, oilspill contingency plans, ongoing OCSEAP and BLM research programs, etc. The Task Force would also evaluate the effectiveness of lease stipulations, OCS orders, and other regulations. Proper enforcement of lease stipulations and OCS orders would be of particular importance. Recommendations would be made directly to the appropriate agency (i.e., USGS for lease stipulations, review of exploration plans, etc, OCSEAP or BLM/OCS for studies), and all recommendations would be accorded great weight in that agencies determinations. The Task Force should hold regular meetings which would be open to the public. The composition and duties of the Task Force should be discussed in detail in the EIS, and formally described in the Notice of Sale.

XVIII. STIPULATIONS FOR EMPLOYMENT AND TRAINING OPPORTUNITIES FOR RESIDENTS OF THE NORTON SOUND AREA ARE NEEDED.

Justification for Proposed Employment and Training Stipulation

The Draft Environment Impact Statement for the Norton Sound Lease sale fails to provide stipulations insuring that those people suffering the brunt of the negative impacts of oil development in their area reap some of the benefits of such development.

AVCP has prepared the attached proposed stipulation to insure that local residents of the Norton Sound Area have the opportunity to secure employment and training opportunities.

In anticipation of constitutional challenges to this proposal, AVCP would like to point out that the United States Supreme Court in Hicklin v. Orbeck, indicated that a local hire provision designed to attack the high unemployment rates of Rural Alaskan Residents would pass constitutional muster. [98 SCt 2482, 2488 (1978)]

Proposed Stipulation for Employment and Trainig Opportunities for Residents of the Norton Sound Area

I. Goals and Timetables for Employment and Training

The successful lessee, and his subcontractors shall make a best faith effort to achieve the following goals for local employment:

(A) 100% of labor, trainee, and other unskilled position hours throughout the exploration and development phases of the Norton Sound OCS sale shall be worked by local residents. For purposes of these stipulations, "local residents" describes all those persons residing in the Bering Straits and Calista Areas of Alaska at the time of the lease sale.

(B) The percentage of skill craft position hours reserved for local residents ahll be based upon a manpower survey of the number of qualified local residents available in each of the skill areas. This survey shall be completed by the AVCP prior to the exploration phase. An additional survey shall be carried out prior to the development phase. At the completion of the 2nd survey, the Secretary shall determine an updated percentages goal.

(C) The goals for skill craft local hire shall be determined according to the following formula:

$$\text{Goal \%} = \frac{\text{Number of available and qualified local residents in craft}}{\text{Number of hires projected in craft}}$$

These goals shall be revised annually.

II. Hiring Halls

The lessee and its subcontractors may hire from whatever hiring sources it wishes. However, before it bires a non-local worker, it must give the local monitoring and coordinating office 72 hours to identify and refer a qualified local resident.

Where the lessee and its subcntractors have entered into collective bargaining agreements with unions, the contractor may use the union hiring hall, provided that the union hiring hall agrees, in wiriting, prior to the start of the contract, to refer local residents preferentially regardless of which of the priority referral lists the local resident may be listed on. (i.e. A B.C) Provided further that, if there are no local residents on the union out of work list, the union agrees, in writing, to contact the local monitoring and coordinating office and give it 72 hours to identify and refer to the union a qualified local resident before the union refers a non-resident to the job site.

The unions must also agree to establish mechanisms so that local residents do not have to travel great distances on a regular basis to retain their position on union lists. (This would involve phone or mail preregistration, or such other technique jointly agreed to by the union, the local monitoring and coordinating office, the lessee or subcontractor, and the Secretary of Interior.) Provided further that the union agrees, in writing, to accept for membership or provide a work permit to any local resident referred for employment through this process. If the lessee or its subcontractor cannot get written agreement from its union(s) to these provisions, the lessee or its subcontractor fails to provide such agreement, the lessee and its subcontractor will not be permitted to begin work.

However, where the immediate hiring of a worker is critical to the progress of the project, such that the 72-hour period provided for in this Section II would demonstrably result in the lessees or its subcontractors inability to meet the requirements as to timeliness of the project, the local monitoring and coordinating office shall have only 48 hours to refer a qualified local resident worker. The lessee or its subcontractor shall provide notice that it is utilizing this emergency provision by so indicating when calling in the job request to the local monitoring and coordinating office. Upon request of the government monitoring and coordinating office, the lessee or its subcontractor shall provide documentation justifying utilization of this emergency provision.

III. Counseling

The lessee and its subonctractor agree to participate in such counseling programs for local residents as are established by the local monitoring and coordinating office. Further, no local resident shall be terminated until the local monitoring and coordinating office has been given an opportunity to counsel that worker and the worker is given an opportunity to correct the problems which were to have led to the discharge. Provided further that this provision shall not apply where immediate discharge is necessary for the protection of a safe and efficient working environment at the job site.

IV. Lay-Offs and Reductions in Force

No local resident shall be terminated so long as a non-resident worker in the same craft is still employed. Tbe local resident shall be terminated first, so long as the local worker meets the threshold qualification for the job. Further, if the contractor lays off by crews, qualified local residents shall be transferred to crews that will be retained, so long as there are non-local residents in the same craft employed elsewhere on the job site.

V. Monitoring and Enforcement

The Secretary of the Department of Interior or his designee shall appoint a regionally located manpower facilities, proven with the ability to monitor and coordinate the program of their stipulation for employment and training.

The lessees shall make contributions to support the local monitoring and coordinating office. The Secretary and the office shall mutually determine the amount of meny required to carry out the tasks set out for the office in these stipulations. Half of the determined amount will be provided by the Department of the Interior. The balance shall be made up by the lessees' contributions. Each lessee shall contribute an amount determined by the following formula: Percentage of total costs of office charged lessee = $\frac{\text{lessee lease area}}{\text{total lease area}} \times \frac{1}{2}$

The local monitoring and coordinating office shall have the initial monitoring responsibility as set forth below, and shall cooperate with the Secretary of Interior on all other monitoring and enforcement activities.

The local monitoring and coordinating office shall have the authority to call for a meeting with the lessee or its subcontractor any time reports or other evidence indicates that the lessee or its subcontractor is not meeting its local resident hiring goals, or is failing to comply with other provisions in these Requirements Regarding Local Preference. If, after the meeting, it appears the lessee or its subcontractor explanation demonstrates he is in compliance, the matter will be dropped. Otherwise, if the local monitoring and coordinating office and lessee or its subcontractor can agree on remedial steps to correct the problem, such steps shall be set out in writing; signed by the lessee or its subcontractor, the local monitoring and coordinating office, and the next higher tier contractor (where appropriate), and

the union (where appropriate), and the Secretary of Interior shall become part of the contract. If the parties are unable to agree on remedial action, or if the lessee or its subcontractor fails to comply with remedial action set out in a written contract modification as described above, the local monitoring and coordinating office shall submit a formal notice, with supporting information, to the Secretary of Interior. The matter alleged in such notice shall be investigated within twenty (20) days and thereafter promptly resolved by the Secretary of Interior, in consultation with the Employment Rights Office. In the event of non-compliance with these Requirements Regarding Local Preference, the lessee or its subcontractor right to proceed may be caused to be terminated in whole or in part by the Secretary of Interior and the work completed in a manner determined by the Secretary of Interior to be in the best interests of the government. A lessee or its subcontractor who fails to comply with provisions in these Requirements Regarding Local Preference shall be subject to any and all of the sanctions available to the Department of Interior, or its successor agency, under Federal law.

VI. Reporting

The lessee or its subcontractor shall submit to the local monitoring and coordinating office and to the Secretary of Interior office, reports, on forms mutually agreed upon by the local monitoring and coordinating office and Secretary of Interior, showing the lessee's and each subcontractor's employment, promotion, termination, and rate of pay. The report shall be submitted monthly.

The local monitoring and coordinating office shall have the right to inspect the lessee's or any subcontractor's records, and to interview employees on the job site, so long as such action does not interfere with the lessee or its subcontractor's orderly conduct of business.

VIII. Subonctractors Bound as if Lessees

Any and all subcontractors or assignees of lessees, regardless of their tier, shall be bound by these employment and training stipulations.

ARCO Exploration Company
Post Office Box 360
Anchorage, Alaska 99510
Telephone 907 265 6515

G. T. Wilkinson
Vice President
Exploration Operations Alaska

October 9, 1981

Mrs. Esther Wunnicke
Manager, Alaska OCS Office
620 E. 10th Street
P. O. Box 1159
Anchorage, Alaska 99510

Dear Mrs. Wunnicke:

ARCO Exploration Company supports OCS Lease Sale #57 to be held in Norton Sound. This sale is an integral part of the total national energy program that may eventually result in reduction of the dependence of the United States on foreign oil sources.

The following commentary on the "Norton Sound Draft Environmental Impact Statement OCS Proposed Oil and Gas Lease Sale #57" is offered for your consideration.

The DEIS covering the Norton Sound Lease Sale has, throughout the document, an over-riding concern for spills that may occur as a result of exploration and production of oil and gas in Norton Sound. We believe this concern is over-stated, because over the last 10-12 year period, exploration and production of U. S. OCS oil and gas has had an enviable record regarding environmental awareness, concern, and care.

Industry's conscientous efforts have been recognized by Secretary Watt in his July 15, 1981 press release concerning the Proposed Five-Year Offshore Leasing Schedule, when he stated "Every economic form of energy production that is available to us involves some environmental risks. In that regard, offshore oil and gas production in U. S. waters has an outstanding record. It has been over 12 years since the only U. S. offshore accident involving significant pollution took place, and there have been no measurable long-term effects from it identified to date. In the last 10 years, there have been only two spills of more than 1,000 barrels from U. S. offshore platforms. Neither of the spills resulted from a loss of well control; both were stored oil that was spilled."

Additionally, a recent (8/31/81) Newsweek article, "Can the Sea Purge Itself", had the following commentary:

"There was a view 10 years ago that the ocean was a very fragile thing, but the ocean has some important self-cleaning processes that we didn't know about until recently", and "fears and concerns...have not materialized".

Recent research has some scientists concluding that oceans are far more complex and resilient than was thought a few years ago. To totally minimize any impacts man has had on the oceans would be improper. After an oil spill there is recovery by the ocean sufficient to sustain life, though the life may not be the same life that existed in that area before the spill. Therefore, studies of past oil spills cannot be termed conclusive by either the oil industry or the environmentalists.

Specific comments on the mitigating measures and other portions of the DEIS are attached for your review.

We would like to thank you for the opportunity to comment on the Norton Sound Sale #57 DEIS.

Sincerely,

G. T. Wilkinson

GTW:RO/vc

Attachments

ARCO Exploration Company is a Division of AtlanticRichfieldCompany

MITIGATING MEASURES

Page 14 - Orientation Program

ARCO Alaska, Inc. conducts ongoing training programs for its employees at all levels. Furthermore, training of employees in environmental matters and related concerns is a part of the Company's Environmental Protection Policy. As implemented, the policy treats the environment broadly, incorporating cultural and other matters where Company operations would affect those environmental aspects. Such a training program has been developed for use in Company operations.

Page 15 - Transportation of Hydrocarbon Products

This proposed mitigating measure is made without the benefit of alternative design studies for Norton Sound to determine the method of transportation that is the safest, most cost effective and most environmentally sound.

What is required is a flexible standard which requires transportation by the method best meeting the above requirements after proper engineering and design studies are conducted.

The lessor should not stipulate, in advance of such studies, which method should be employed.

The following is a recommendation for rewording the transportation measure:

"The transportation of hydrocarbons produced from leased tracts shall be by the safest and most environmentally sound and cost effective method. In selecting the means of transportation, consideration will be given to coastal management plans, the recommendations of the inter-governmental planning program for assessment and management of transportation of OCS oil and gas, affected Federal, State and local agencies, and industry.

The lessor reserves the right to require that any pipeline used for transportation of production be placed in certain designated management areas. All pipelines, including both flow lines and gathering lines, shall be designed and constructed to provide for adequate protection from water currents, storms, sub-freezing conditions, ice scouring, and other hazards as determined on a case-by-case basis. Following development of the transportation system, no crude oil shall be transported by other means, except in case of emergency".

Page 16 - Seasonal Protection of Marine Mammals from Effects of Oil Spills During Peak Migration Periods

This proposed mitigating measure is unnecessary and would work extreme hardships on lessees for the risk sought to be avoided. The draft EIS estimated 2.8 spills of 1,000 barrels of oil or more over the life of the discovered fields in this sale area. This figure includes spills which may occur during drilling, production and/or transportation operations. The risk of blowout during exploratory drilling on the OCS is infinitesimally small as seen in the report by E. P. Danenberger (1980, "Outer Continental Shelf Oil and Gas Blowouts"). During the period 1971-78, twenty blowouts occurred during exploratory drilling or completion operations out of 7,553 new wells drilled, or one out of every 378 wells. Total spillage (including blowouts during production and workover operations) was less than 1,000 barrels out of 2.8 billion barrels produced.

The extremely low risk of an oil spill occurring during exploration operations coupled with the lack of observed effects of oil spills on whales, and the probability that any spill which might occur would be low in volume makes this mitigating measure unacceptably onerous to operators, and unnecessary for the protection of marine mammals.

Page 17 - Area of Special Concern

This proposed mitigating measure has not taken into account, as an example, the possibility of an island constructed to hold a tank(s) for the storage of produced oil. This construction would include berms designed to contain the contents of the storage tank and a reasonable (25%) excess. For the offloading of the stored oil to tankers, any spill that may occur could be minimized by adhering to standard operating procedures that have been proven by industry.

Therefore, we propose the following stipulation for the area of special concern:

"Storage and loading of produced oil, except during testing, shall be permitted on block numbers 398 through 413, 447 through 456, 486, 487 through 501, 530, 531, 533 through 545, and 578 through 581, upon a showing to the DCM that such storage and loading can be safely accomplished through sound engineering principles and operating procedures, giving due recognition to the potential hazard an oil spill would pose to the sensitive habitat area of the Yukon River Delta".

Table III.A.2.a-2:

The extreme wave heights are unrealistically high considering the maximum water depth in the vicinity of the OCS sale area is only 180'. The use of Brower's model (primarily deep water) for wave and wind characteristics may not be appropriate for shallow bodies such as Norton Sound.

Page 82, Paragraph 2:

Delete this paragraph. It is better stated on Page 81, Paragraph 4. (Also redundant).

Page 103, Paragraph 1:

"Where water...appropriate materials". This sentence is unclear. Does it mean in depths greater than 19 meters, or shallower than 19 meters?

"For additional...caisson-retained". The usual reference to "caisson-retained" is a concrete or steel retaining structure with material such as sand or gravel, not concrete, filling it.

Page 103, Paragraph 3:

As stated in the text, these numbers are wrong:

62,622 mbbls/day, 273,972 mbbls/day

The correct numbers are:

62,622 bbls/day and 273,972 bbls/day

Page 103, Paragraph 6:

What is the "work month"? Cumulative? Annual? How does this term "work month" relate to the number of people?

Page 104, Paragraph 6:

Change to "Exploration activities could begin by...".

Page 106, Paragraph 5:

This paragraph should be reflective of U. S. tanker fleet activity and not worldwide activity due to the more restrictive regulatory requirements placed on the U. S. fleet. The environmental risks of offshore oil and gas development and production are significantly lower than the risk posed by foreign fleet tankers carrying imported oil which, in part, would be displaced by new OCS production.

SPECIFIC COMMENTS

Page XI, Paragraph 4:

Add the following sentence between "...about 2900. Even with...". With this number of commuters, there would be an approximate 200 personnel per day turnaround which amounts to increasing air service by one Boeing 727-type airplane.

Page XII, Paragraph 3:

"Psychological stress" is not quantifiable as stated; therefore, why should there be any attempt to mitigate or even theorize this aspect?

Page 11, Paragraph 1:

September should be November.

Page 12, Paragraph 2:

Due to ice conditions, one rig drilling three wells per year may not be possible; also, pipeline construction would be more or less continual until the last platform was in place.

Page 22, Paragraph 1:

Same as comment for Page XI, Paragraph 4.

Page 25, Paragraph 8:

Main trunk lines and gathering lines are two different types of pipelines, and depending on which type is alluded to in this paragraph, pipeline construction would be more or less continual until the last platform was in place.

Page 27, Paragraph 5:

Same as comment for Page 25, Paragraph 8.

Page 28, Paragraph 8:

Same as comment for Page 25, Paragraph 8.

Page 32, Item K:

Change souring to gouging, consistent with Table III.A.1.-1.

Page 35, Paragraph 4:

Change scouring to gouging, consistent with Table III.A.1.-1.

Page 107, Summary Table:

Rather than using Gulf of Mexico data to draw comparisons, Cook Inlet operations and data, if used, would be more relevant to Alaskan offshore waters.

Page 110, Paragraph 5:

By using the order as posed in 6. Oil Spill Response, the industry effort is grossly understated. It should be recognized that industry cleans 99% of its own spills with little, if any, assistance from governmental agencies. We suggest placing the industry case first, with governmental agency involvement following.

Page 111, Paragraph 4:

See comment for Page 110, Paragraph 5.

Page 116, Paragraph 1:

Add "A significant amount of proprietary environmental data gathered by industry may become available to prove compliance and meet permit stipulations".

Page 131, Effect of Mitigating Measures:

The use of "mitigate" in the last sentence is improper. This word could/should be "eliminate".

Page 147, Paragraph 3:

The suggestion of heavy equipment in biologically sensitive areas is not representative of industry concerns and area-wide pre-planning efforts.

Page 153, Paragragh 6:

Insert "small". "There exists a small possibility...".

Page 157, Paragraph 1:

The last sentence of this paragraph is based on supposition, and we recommend deletion of this parenthetical statement.

Page 157, Paragraph 4:

"However, because...proposed sale area". This statement is contradictory to statements made in Paragraphs 1 and 3.

Page 158, Paragraph 2:

Shorefast ice would act as a buffer to any oil-contaminated moving ice, and would tend to prevent this oil-contaminated ice from reaching sensitive areas that may be located onshore.

Page 159, Paragraph 4:

We recognize the concern that has been expressed of spilled oil reaching a sensitive environmental area such as the Yukon Delta. The writer has discussed the damage that might result if an oil spill were to occur, but should be complimented for emphasizing the fact that the probability of an oil spill occurring is less than 1%, which puts spill statistics in proper perspective. Furthermore, the DEIS states that if hydrocarbons are discovered, they will be gas, which would further reduce the risk associated with an oil spill. (The probability of finding gas rather than oil is purely speculative at this point in time, and should not be stated in such a factual manner.)

Page 166, Paragraph 4:

The statement "Drilling muds containing heavy metals are prohibited by the EPA" should be added to this paragraph.

Page 169, Paragraph 3:

We suggest inserting the following after "detrimentally":

"Additionally, food supplies for mammals and other marine life seem to be attracted to underwater vibration. This situation, well documented in Gulf of Mexico studies, has shown no detriment to marine life cycles. Geophysical exploration is conducted with restrictions imposed by State and Federal agencies. These restrictions have allowed exploration to be conducted so as not to impose stress or disturbance to marine, as well as land animal life, in the Arctic regions."

Page 170, Paragraph 2:

No account is given to animal avoidance mechanisms related to the presence of spilled oil. See Page 164, Paragraph 1 describing use of gasoline to disperse milling walrus.

Page 178, Paragraph 3:

Assuming gas vapors remain over spilled oil, only then may there be some inhalation. For mammals of this type surfacing in an area of a spill and its related activity appears paradoxic to other statements made in the DEIS; i. e., animals may leave area, change their migration route, etc. (See Page 177, Paragraph 8).

Page 181, Paragraph 4:

Peregrines are flight hunters, with no ability to swim. The probability of their contact with oil on water is very remote.

Page 196, ALT. III:

This offers no real advantage, as technology exists today to develop these fields.

Page 244, Paragraph 3:

Due to environmental restrictions/permit limitations, this practice would not be allowed if the Clean Water Act mandate of zero discharge by 1985 becomes reality.

Bibliography:

The reference data attributed to Brower suggests a publication date of 1972. Actually, the Brower report referenced in the text states the correct date of 1977. It is also suggested that the bibliography from Appendix K be included in the bibliography listed for the main body of the report.

BERING STRAITS COASTAL RESOURCE SERVICE AREA BOARD
c/o City of Unalakleet
Box 28
Unalakleet, Alaska 99684
(907) 624-3531

Harry V. Boone
Golovin, Ak 99762
Paul Renkok
Box 135
Savoonga, AK 99769
Robert Blodgett
Box 645
Teller, AK 99778
Frances Degnan
Box 33
Unalakleet, Ak 99684
Dwight Milligrock, Sr
Box 158
Nome, AK 99762
Andrew Daniels
Elim, Ak 99739
Morris Coffey
Stebbins, AK 99671

31 August 1981

Director
Bureau of Land Management (542)
Department of the Interior
18th & C Streets N.W.
Washington, D.C. 20240

Dear Sir:

This letter is in reference to the recently released Draft Supplement to the Final Environmental Statement. This involves the proposed five year OCS Oil and Gas Lease Sale Schedule, and a number of alternatives to the schedule. I have recently been employed by the Bering Straits Coastal Resource Service Area (BSCRSA) Board to develop an approved coastal plan for this region. Therefore, my following remarks will relate specifically to the Bering Straits - Norton Basin lease sale.

Much of the resource information in the Bering Straits - Norton Basin region is sketchy and reconnaissance in nature. Detailed information is sorely lacking, and there are numerous gaps in the existing reports. It is a major goal of the BSCRSA Board to compile a Resoure Library for this region, and from this and related information to develop an approved coastal zone management plan. The current timeframe indicates this regional plan will not be completed for another three years.

We are extremely concerned that the present schedule for leasing the Norton Basin indicates that this area will be leased prior to the development of an approved plan. We feel that this precludes proper planning and negates the importance of a coastal zone management plan.

We respectively request that Norton Basin leasing be delayed until a coastal zone plan for the Bering Straits Region is formulated and approved.

Shishmaref, Wales, [illegible], Brevig Mission, Teller, [illegible], White Mountain, Golovin, [illegible] Council, "Nome East", Elim, Koyuk, [illegible], Unalakleet, Stebbins, St. Michael, Grantley Harbour

Director, BLM (542)
Washington, D.C.
Page 2

The BSCRSA Board has a number of other concerns as it relates to the proposed leasing schedule in Norton Basin. They feel that the Draft Supplement and Final Impact Statement are too general and do not adequately address the possible adverse effects that may occur. Additionally, they feel that not enough attention is given other resource values that exist in this area. These will be covered in greater detail at a later date.

We thank you for your consideration in this matter and seriously request you delay Norton Basin leasing until the region has an approved coastal zone management plan.

Sincerely yours,

BERING STRAITS COASTAL RESOURCE
SERVICE AREA BOARD

Diane Hemnes

Diane Hemnes, Coordinator

DH:cn

cc: Sylvia Spearow, CRA
Michelle Shook, OCM
Board Members, BSCRSA
files

FEIS PROPOSED 5-Year OCS Oil and Gas

LEASE SALE SCHEDULE

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Alternatives

Alternative #3

Delay Sales proposed for Norton-Basin, St. George and Northern Aleutian Shelf from dates proposed in Alternative 1. (September, B2; December 82 and October 83, respectively, in order to allow Unorganied Boroughs to undertake local coastal zone management planning (Alternative 3).

Summary

Environmental Consequences

1. Involves marine resources and their habitat.

2. Subsistence Resources in marine habitat, waterfowl vegetation of renewable resources which exist in the Alaska Lifestyles.

3. Sensitive marine mammals and seabirds.

4. The environmental effect of arctic development due to the lack of existing technology in the area.

5. Consequences of large oil spills in sea or ice conditions, recovery technology.

6. Cumulative Impact to endangered whale species and marine wildlife and their habitat.

There should never have to exist a possible oil spill. The arctic is too sensitive in our marine mammal, waterfowl or recovery of existing greens or berries the Alaska lifestyle depends on.

Summary Page 1

Environmental Consequences

The Norton Basin offshore is sensitive to oil spills impacts to waterfowl, marine mammal populations, based on available, but limited data. Relying on CSRA Board policies can bring the limited data to where the existing 19 villages can develop their coastal management plan. The BSCRA Board cannot go by limited data.

g. Summary Page 1

Besides the potential of oil spills and other pollution contaminant events to impact fish stocks, commercial fishery use, subsistence use should be added also.

Gear damage and loss of fish stocks is a conflict.

These sales, Norton Basin, St. George Basin and Northern Aleutian Shelf, proposed under Alternative 1 for 19B2 and 19B3, could be delayed in order to allow for additional time for Coastal Resource Service Areas to be formed, CZM plans completed, approved and implemented. This alternative would delay a Norton Sale until 19B5. The Norton Area is the least prepared to undertake coastal zone management planning at the present time. It would delay the other two sales until 1984.

b. The Bering Straights Coastal Resource Area Board has been certified by the State of Alaska Lieutenant Governor, Juneau, the Capital, the 9th day of June, A.D. 1980.

c. I, Terry Miller, Lieutenant Governor of the State of Alaska, do hereby certify that, in accordance with provisions of A.S. 46.40.140 an election for the Bering Straights Coastal Resource Service Area Board was held on April 22, 1980 and that the following were elected to the initial Service Area Board:

Seat One: Dwight Milligrock, Sr. (3 year term)
Representing: Shishmaref/ Wales / Diomede

Seat Two: Bob Blodgett (2 year term)
Representing: Brevig Mission / Teller / Nome West

Seat Three: Harry Boone (3 year term)
Representing: White Mountain, Golovin, Solomon, Council / Nome East

Seat Four: Andrew Oaniels (2 year term)
Representing: Elim / Koyuk / Shaktoolik

Seat Five: Frances Degnan (1 year term)

Representing: Unalakleet

Seat Six: Morris Coffey (1 year term)

Representing: St. Michael / Stebbins

Seat Seven: Paul Rookok (3 year term)

Representing: Gambell, Savoonqa

THE ENVIRONMENT IMPACT STATEMENT DO NOT HAVE ANY Interpreters FOR OUR ELDERS.

Written comments will be forthcoming.

Understanding and knowledge of nature does not mean that we have to obey them.

However - Compensation is Available.

The Norton Sound Region would like to know specifically how our renewable resource is valued in dollars or alternative resources? This jeopardizes our lifestyle both in hunting, fishing or food gathering such as berries and greens. They place our renewable resource as a priority. This is all included in their diet. There also exists that the fish processing onshore in Norton Basin must be also compensated. The Northern Bering and Arctic Regions where commercial fishing is utilized we must realize there exist and a lot of the spawning grounds. This is critical for fish recovery.

Subsistence harvesting of fish and marine mammals in Alaska may be also impacted in the 5 years of oil and gas lease sales through conflicts in resource use or from oil spills.

Alternative #3: Delay Sales in Norton Basin, St. George Basin and the Northern Aleutian Shelf.

a. Description of Alternative 3 Page 73

The area of Alaska where the Unorganized status of adjacent shoreline results in greatest concern for coastal zone management plans is the Bering Sea Region and Norton Sound. Areas adjacent to Norton Sound Basin, St. George Basin and Northern Aleutian Shelf have not as yet initiated any efforts to become eligible for CZM funding. In the absence of a regional comprehensive plan or a CZM plan, no local control could be exercised in enclave siting decisions or over indirect land uses associated with these proposed sales, although provisions of the Alaska State Coastal Manage[illegible] would apply.

ENVIRONMENTAL SERVICES Ltd.

30 September 1981

Judy Gottlieb
Alaska OCS Office
Bureau of Land Management
P.O. Box 1159
Anchorage, Alaska 99510

Dear Ms. Gottlieb:

Environmental Services Limited (ESL) is presently under contract to the city of Nome to prepare the City of Nome Coastal Management Program. As principal planner for the firm on this project I would like to make the following comments on the draft EIS for the proposed federal sale of oil and gas leases in Norton Sound (Sale no. 57). These comments are based on my knowledge of Nome and the region from having worked in the area, and in no way represent the opinions of the City of Nome.

In general the document is very thorough however some data used in the Nome Community Infrastructure analysis is innaccurate or dated, and could lead to different conclusions, particularly with regard to housing and land use issues. The background report for the Nome Coastal Management Plan, prepared by ESL, contains some substantially updated information on all aspects of the city of Nome. BLM-OCS office should have received copies of the background report and public hearing draft of the Nome Coastal Management Plan from the Alaska Department of Community and Regional Affairs - Division of Community Planning.

Specific concerns include:

Page 52. Much of the section on Nome Community Infrastructure (Section III, B, 5) should be reviewed in light of the Nome CMP Background Report and other more recent events which have occurred in Nome;

Page 53. Education, fourth paragraph - the dilapidated classroom and gymnasium structure was built in 1935 not 1975;

Page 54. Public Safety - in August 1981 the Nome Planning Commission recommended that Block 112, in the extreme northeastern section of the Nome townsite, be used by Alaska DOT/PF

835 WEST NINTH AVENUE ANCHORAGE, ALASKA 99501 (907) 276-4216

for construction of a new 50 bed regional detention facility.

Page 55-56. Utilities - much of this discussion appears to be based on the 1976 Sewer and Water Plan prepared by CH2M Hill. Since that time, the Public Health Service has funded several major utility extension projects which now provide sewer and water service to about two-thirds of Nome's households. June 1981 data from the Nome Joint Utilities showed 711 customers with piped water and 193 with trucked water service. Figures for sewer hookups were not readily available but should be similar to the figures for water service.

Page 57. Land Use and Housing - The description of Nome's corporate boundaries should include a discussion of a very recent development (September 1981) whereby the Nome City Council resurrected a 1901 boundary description for the city which indicates the city of Nome to be some four to five times larger than the surveyed townsite. This old boundary description appears in the Alaska Local Boundary Commission files. The area within this boundary includes the site of the proposed deepwater port, Nome City Airport and most of Nome Airport. Areas which remain outside the boundary are Icy View, the Nome-Beltz complex and Cape Nome.

Page 58. The 1968 housing survey is very dated due to major public and private housing development during the past 13 years. While housing conditions in Nome continue to show many sub-standard units, housing conditions are improving. A 1981 field survey conducted by ESL with assistance from Nome's city planner/assessor showed the following numbers of housing units:

Rating	Number Units	% of Total
Sound	212	22.5
Deteriorating - needs minor repairs	564	59.8
Deteriorating - needs major repairs	165	17.5
Dilapidated	10	1.1
Total	951	100 %

Overall, the figures sited in the DEIS on total numbers of housing units are low - our survey showed 951 units, and the 1980 U.S. Census revealed 901 units. While housing shortages remain a problem, the private housing market in Nome is actively working to increase supply. The City Clerk's September report to the Nome Planning Commission indicates that the city has issued building permits for 56 new housing units during 1981.

Page 59. Figures III. C. 1-1 and III. C. 1-2 appear to be reversed.

Page 90. An important part of the discussion on local policies or control over OCS activity should address the lack of jurisdiction over potential OCS activity by local government. This results from the lack of the city's jurisdiction over potential OCS activities or facilities at Cape Nome. Further, the Bering Straits CRSA Boards Coastal Management Plan will not be completed for a few years, and means of implementing coastal management programs in the unorganized borough are limited. Further, there is no local governing with any planning or zoning jurisdiction over Cape Nome. The city administration has expressed considerable concern over dealing with impacts on local housing, utilities, transportation and municipal services resulting from any eventual OCS activity or facilities at Cape Nome.

Page 93. The 1981 Nome Coastal Management Plan includes a recommended land use plan and policies for the Nome townsite. This document has not yet been approved by the planning commission or city council. As this plan is based on community input through a survey, workshop and meetings, it better represents local concerns and desires than the 1968 plan referenced in the DEIS.

Page 94. The discussion of annexation in paragraph four should also acknowledge the "new" city boundaries (see page 57 comment).

Page 125. In the conclusion relative to OCS development, it is stated that "white residents of Nome . . . for the most part welcome the new population and its stimulating economic effects". ESL's 1981 survey of Nome residents revealed that support for the oil and gas related development is widespread among the entire Nome community, both native and nonnative. The Nome native community, however, should not be construed as representative of the regional native population.

Page 142. Paragraph five - The city administration feels that various state or federal housing projects and private industry will fill housing needs if adequate land is made available. The number of new housing starts indicates that the private sector is working to fill some of the demand. Sitnasuak Native Corporation has been the leader in developing housing in Nome. Availability of land was expressed as a factor in discouraging public housing projects according to representatives of the Bering Straits Regional Housing Authority.

Page 241. Paragraph 1 - the conclusions relative to spillover effects are genuine and cannot be adequately handled merely through the Nome CMP. In general, the Nome CMP and Comprehensive Plan do address some OCS concerns, however, the physical limitation of Nome's jurisdiction, a lack of understanding as to

what OCS related activities really may occur, and a general reluctance by local political leaders to accept local land use controls may limit the program's ability to mitigate impacts of major OCS development near Nome.

I hope you find these comments useful.

Sincerely,

Dick Mylius

cc: Ivan Widom, Nome City Manager
Mark Stephens, DCRA - Division of Community Planning

OM/rln

EXXON COMPANY, U.S.A.
POST OFFICE BOX 4279 · HOUSTON TEXAS 77001

EXPLORATION DEPARTMENT
ALASKA/PACIFIC DIVISION
R.D. WILSON
MANAGER

October 8, 1981

Draft Environmental Impact Statement
for the OCS Proposed Oil and Gas
Lease Sale #57

Mrs. Esther Wunnicke
Alaska OCS Office
P.O. Box 1159
Anchorage, Alaska 99510

Dear Mrs. Wunnicke,

Exxon Company, U.S.A. is pleased to have the opportunity to provide the following comments on the Norton Sound Draft Environmental Impact Statement (DEIS) for the OCS Proposed Oil and Gas Lease Sale 57. Overall we feel this is a good draft document. We offer our comments in a constructive sense and hope they will be helpful in preparing the Final Environmental Impact Statement (FEIS).

During our review, we were struck by the negative tone of certain sections of the DEIS particularly with regard to the impacts of oil spills. We feel that in the summary of impacts, there is an overstated concern over oil spill risk and impact, without appropriate emphasis on the low probability of spills, or an accurate description of the effectiveness of existing clean-up and control technology. We maintain that the worst impacts from oil spills described in the DEIS can be substantially mitigated by this technology. Scientific analysis of unrealistic 'what if' spill scenarios is unproductive and does not serve the intent of the environmental assessment (NEPA) process. These scenarios stimulate emotional opposition which often overwhelms a logical consideration of the environmental advantages and disadvantages of a proposal.

Our understanding of the NEPA process is that an environmental impact statement should not be a position paper which attempts to condemn a project by the sheer weight of its negative aspects. Rather the EIS is an important document which should present the facts surrounding a proposed action, and its alternatives, in an objective manner, free from unsupported statements of opinion. Those preparing environmental impact statements are responsible to the decision makers and the public for this factual presentation. Likewise, Exxon accepts the same responsibility in criticizing those statements.

We realize that hypothetical but realistic exploration and development scenarios are necessary to assess the environmental impacts of a proposed lease sale. We are pleased that the Bureau of Land Management has emphasized throughout the DEIS that these scenarios are assumptions and are not indications of preference or endorsements of development schemes. Nevertheless,

we have found a number of assumptions and scenarios that we feel are unrealistic and that have given rise to proposed lease stipulations which we must oppose.

Our detailed comments to the DEIS are appended to this letter. However, we want to emphasize our concern here over the following three proposed lease stipulations:

- o The transportation of hydrocarbon products
- o The seasonal drilling restrictions
- o The offshore storage and loading restrictions

Regarding the Transportation of Hydrocarbon Products measure, we do not feel that offshore pipelines are necessarily environmentally preferable to other transportation systems. Detailed field and engineering investigations of site-specific conditions may reveal that a pipeline is not the best transportation alternative. We therefore support maintaining the flexibility to adopt alternative transportation schemes including transportation of hydrocarbons to shore by barge or tanker. We are opposed to the measure if it precludes tanker transport of oil or gas from a nearshore single point mooring terminal. We would also be opposed to the measure if it requires overland pipeline transport to terminals outside of the Norton Sound area.

Our second major concern is seasonal drilling restrictions. We believe that the seasonal drilling restriction to protect marine mammals from oil spills should be deleted from the FEIS because there is insufficient evidence of adverse impact. Oil spills having long-term adverse impacts are very rare events. The published research findings and observations cited in Section IV.B.2.d and e, clearly point to the fact that documented cases of mammalian mortality or long-term harm from exposure to hydrocarbons in the marine environment are even more rare. Even controlled exposure of marine mammals to oil has not demonstrated long-term or irreparable adverse effects. Many of the concerns expressed in this section are based on conjecture. The 'what if' scenarios may be useful in assessing potential consequences but should not be used to support the seasonal drilling restriction when much of the literature cited reports only temporary or no effect at all from exposure to oil. The growing body of data which indicates that marine mammal exposure to oil is not as detrimental as once believed supports our recommendation to delete this measure. Exxon believes that additional research should focus on marine mammal reaction to reasonable oil spill scenarios. If results indicate significant adverse impact, then the site-specific probability of similar exposures should be evaluated and mitigating measures prescribed accordingly.

The dependence of many marine mammal species on their sense of hearing is well documented. But the adverse effect of industrial noise is not as well documented. Observations of mammal behavior near ship or barge traffic may be attributable to factors other than noise. We think it is important to make a distinction in the FEIS between response to industrial noise and disturbance by noise. A response is simply an induced reaction which may or may not be harmful. A disturbance does imply a change which is harmful to varying degrees.

We believe the EIS is incomplete if it assumes that drilling can be done only during ice free periods. Using ice-strengthened drilling rigs together with ice-breaker support, industry can drill safely in Norton Sound until ice thickness reaches about three feet. Dome Petroleum, LTD. has successfully used this technique in three feet of ice in the Beaufort Sea. Designs are being developed for drilling systems which could operate under even thicker ice conditions. Drilling may then be able to continue year round.

Exxon's third concern is the proposed lease stipulation which would prohibit the storage and loading of produced oil in the southern portion of the sale area. This restriction is based on two opinions: first, that an oil spill will move unrestricted to the Yukon River Delta, and cause severe impact, and second, that there is a "... lack of available and proven technology to respond to spill incidents...". These opinions were voiced during the scoping process by those who apparently were unfamiliar with industry's capability to respond to spills. They could not have known then that analysis would reveal that there is only a 2% chance of any spill ever reaching the delta. The expression of these uninformed opinions, considering the lack of that information, is understandable. However, we do not understand how the authors of the DEIS, who are informed, can possibly justify such a restrictive lease stipulation.

It is somewhat surprising that this measure was proposed because the Bureau of Land Management is well aware of the spill probability in this area and of the effectiveness of spill prevention and control technology. The detailed discussion on oil spill response strategies, contingency planning, and the oil spill scenarios in Appendix K of the DEIS is well done.

Appendix K points out that the oil industry has expended considerable effort to develop oil spill control and clean-up equipment and techniques. Industry has established organizations with the specific responsibility for mobilizing and supervising spill-response teams. In fact, the first steps are now being taken to form an industrial oil spill response team for Norton Sound. Research and development are continuing, and oil spill contingency plans continue to be improved.

Exxon therefore recommends that the proposed lease stipulation restricting offshore oil and gas storage should be dropped from further consideration. We also request that the unqualified phrase, "...lack of available and proven technology to respond to spill incidents...," be deleted because it is inaccurate and inflamatory.

The assessment of oil spill impacts throughout the FEIS should be qualified by a more detailed consideration of the effectiveness of individual spill prevention and control techniques. In addition, a thorough discussion of the effectiveness of these techniques should be added to DEIS section VI.A.6 which now only lists a few spill clean-up techniques.

Exxon believes that the Estimated Schedule of Development and Production proposed in the DEIS is too optimistic. Initially one season will be required to conduct site surveys, develop an exploration plan, and

offshore environments, it may take seven to ten years after discovery to begin production. We therefore recommend that the schedule be revised, taking this experience into account.

We see no substantial justification for Alternatives II through VI. In our opinion the discussion of the No Sale Alternative should be rewritten to emphasize more clearly the consequences of adopting this alternative in terms of national security, balance of foreign trade, other economic issues, and the development of alternative energy forms.

In conclusion, Exxon Company, U.S.A. supports the Norton Sound Draft Environmental Impact Statement for the OCS Proposed Oil and Gas Lease Sale #57 with the exceptions noted above and in the following attachments. We appreciate the opportunity to provide our comments and we hope they will be of help to you in preparing the Final Environmental Impact Statement. We would be glad to discuss any of our comments with you.

Sincerely,

R.D. Wilson

RDW:OTS:gb
Attachments

Attachment to a letter sent to:

Mrs. Esther Wunnicke
Alaska OCS Office
P.O. Box 1159
Anchorage, Alaska 99510

ATTACHMENT I

Detailed Comments on the Norton Sound
Draft Environmental Impact Statement,
OCS Proposed Oil and Gas Lease Sale #57

Submitted by

Exxon Company, U.S.A.

October 16, 1981

We offer the following comments hoping that they will be helpful in preparing the Final Environmental Impact Statement.

Page xii, Third Paragraph, Sixth Line - "The proposed onshore development period (1981-1991)." Comment: We would not expect onshore development, with the exception of minor support facilities for exploration, until about 1987 at the earliest (three years for exploration, two years for permits, one year to construct/ship materials).

Page xii, Third Paragraph, Beginning Line Six - "Villages most likely to be affected by an oil spill would include..." Comment: This is an alarming prediction if a villager, whose subsistance strategy is based on hunting and fishing, happens to live in any of the villages identified. In the context of a threat to their survival, we doubt that the concerns of these villagers will be mitigated by training them to clean up oil spills. Instead they do need to know that the probability of a spill is very low and the probability of a spill reaching their prime hunting and fishing areas is even lower.

We recommend that in the FEIS the statement of oil spill impacts (page xiii, third paragraph line 6) be preceded by a statement of the probability of a spill occurring, and the effectiveness of control technology to prevent and mitigate spills. This will provide the proper perspective from which the reader can reach his own conclusion on what would happen if a spill ocurred.

Page xii, Fourth Paragraph, Last Sentence - "Improper design and siting of onshore facilities could alter water quality and interfere with migration." Comment: This sentence should be omitted or qualified by recognizing that this is not likely to occur since resource agencies (EPA, USGS, NF&WLS, ADNR, AOEC, DF&G) review permit applications for onshore facilities. In addition, the industry will continue to take special measures to safeguard water quality and to maintain safe migration routes for all species of the marine environment that might be vulnerable to such installations.

Page xiii, First Incomplete Paragraph, Last Sentence - "Should a spill contact the Yukon River Delta, clean-up of the spilled oil may be impractical and its natural persistence and effect on resident birds and fish may last for years." Comment: This sentence is conjecture and without scientific documentation. An unsubstantiated statement such as this has no place in the Summary of the EIS and should be omitted from the FEIS.

Page 21, Measures Intended to Mitigate Visual, Wilderness, and Recreational Resources Impacts "(c) Annexation and taxation of onshore OCS facilities by the city of Nome". Comment: This proposed measure should be either clarified or deleted because it would not mitigate visual, wilderness or recreational resources impacts.

Page 25, 3. Alternative III - Delay of Sale: b. Summary of Probable Impacts - Comment: This summary should include the following sentence: The delay would increase the likelihood of continued oil and gas imports and the imbalance of foreign trade payments.

Figure III.C.1. - 1 and 2 between pages 59 and 60. The landsat images are matched with the wrong captions, Figure III.C.1.-1 is the late winter image.

Page 97, b. Geologic Hazards, Second Paragraph - Comment: The statement that geologic hazards found in Alaska are unique in terms of severity and complexity is not documented in the text. This statement should be substantiated or else deleted from the text.

Page 104, 3. Activities Associated with Production - Comment: The impacts of secondary recovery projects during both the development and production periods should be included for the EIS to be a complete document.

Page 106, b. Probability of Oilspills Occurring, Lines Two and Three "The probability of oil spill occurrence is based on the fundamental assumption that realistic estimates and future spill frequencies can be based on past OCS experience." Comment: This is incorrect because it includes old practice with new, ignoring all improvements in exploration, production, and transportation technology in the 30 years since OCS operations were first attempted. In consideration of this, oil spill probabilities should be based on spill frequencies during the last 5 years for OCS operations in harsh environments, such as the Canadian Beaufort, Cook Inlet, and the North Sea.

Page 106, Last Paragraph - Comment: Discussed are statistics used to calculate tanker accident rates. It should be noted that all tanker shipment out of Norton Sound would be performed by U.S. vessels whose tanker accident statistics are better than the worldwide statistics. The report used to calculate these rates had no breakdown or detailed listing of tanker spill statistics.

Page 113, d. Clean-up Policies and Techniques - Comment: We recommend that a summary of individual clean-up techniques be discussed. There are many good references on the subject. However, a good synopsis of the various techniques is contained in the ABSORB oil spill contingency plan. Attachment II to these comments would be a suitable introduction to the detailed discussion.

Page 124, a. Impacts on Population - Comment: The FEIS should clarify the reasons and causes (if any) for projecting the drastic increase in the resident population (non-enclave) at Nome. Historically, enclave populations for oil and gas industry activities are self-sufficient in all aspects and

without dependency on nearby communities. Furthermore, any degeneration of local moral/social subsistence, etc. values which may be anticipated should be clearly identified as caused by an increase in the resident population which is neither encouraged nor needed by the oil and gas industry for exploration or development activities in frontier areas. The base case for the OEIS states that an enclave for commuters would be more than 10 miles from the current city limits of Nome. Considering the work schedules, restricted transportation, and rules of conduct of the communities, there is little opportunity for enclave domiciled employees to impact the local community to any significant degree.

Page 137, First Complete Paragraph - Comment: The statement that seasonal drilling restrictions could benefit the villages dependent on marine mammals should be substantiated or else deleted from the text. There is still no proof or even indication that industry's presence year round would cause significant disturbances.

Page 154, Last Sentence - Comment: Offshore structures have demonstrated an enhancement of biological productivity. The benefit of petroleum facility site-restrictions on commercial fishing in the Norton Sound should be substantiated or the statement should be deleted from the text.

Page 175, Effect of Mitigating Measures, Second Paragraph - Comment: It has not been scientifically documented that underwater noise or vibration associated with exploration activities has any significant long-term adverse effect on birds or mammals. There is no justification for including more stringent mitigating measures in the Information to Lessees to address speculation and unfounded concerns.

Page 176, First Paragraph - Comment: There is no scientifically documented benefit to birds or mammals by imposing seasonal restrictions on exploratory drilling activities. This restriction should be substantiated or deleted from the text.

Page 185, Effect of Mitigating Measures - Comment: There is no scientific documentation that seasonal restrictions on exploratory drilling will benefit gray whales. Reference offshore California experience. This justification for seasonal restrictions should be substantiated or deleted.

Page 194, C. Alternative II - No Sale - Comment: This discussion should include the impacts on National Security, economics and alternate energy forms.

PAGE 230, First Incomplete Paragraph Lines Three and Four - Comment: It is unclear how exploration and production in the OCS could interfere with or "cut off" the natives' access to religious, archaeological, and historic sites. Protection and access to sites can be accomplished under existing laws and regulations. Certainly, with existing safeguards and without further mitigating measures, potential impact from exploration is extremely low.

Page 232, Third Complete Paragraph - Comment: We agree that planning and siting of onshore facilities would mitigate any perceived impacts on visual, wilderness and recreational values. Therefore, onshore and offshore activities will not create impacts on the Iditarod Trail, the Iditarod Race, displacement or damage to the Cape Nome Roadhouse, or other recreational, historic, or wilderness values. Onshore facilities cannot be presumed to create unavoidable "nuisance" effects.

Page 248, J.2. Social Systems - Comment: The DEIS states that lack of consideration by incoming OCS populations, may cause many of the traditional Eskimo behavior patterns and cultural material products to be permanently lost. It should be noted that this could possibly happen if there was complete interaction between the OCS workers and the local residents. But since the OCS workers would be mainly unattached from the local residents, it is rather doubtful that limited interaction will cause the local residents to abandon their traditional customs and values. In addition, the authors state that archaeological remains may be lost due to trespassing and theft. This statement is unfounded and has no place in the FEIS.

OTS:gb
10/7/81

Attachment to a letter sent to:

Mrs. Esther Wunnicke
Alaska OCS Office
P.O. Box 1159
Anchorage, Alaska 99510

ATTACHMENT II

Introduction to a Oiscussion
of Oil Spill Clean-up Techniques

Submitted by

Exxon Company, U.S.A.

October 16, 1981

INTROOUCTION

In the open water season, in the absence of significant ice cover, the same oil spill clean-up technology used in more moderate climates can be used in Norton Sound. Aside from the additional physical discomfort and hazards associated with working in cold weather, clean-up techniques will be similar to those used elsewhere in the world in warmer waters.

However, the presence of partial ice cover during part of the operating season will require technology different from that used in temperate climates. Low temperatures and floating ice cause some oil spill clean-up problems, but they also provide unique solutions to others. For instance, skimmer vessels have to be ice strengthened to cope with frequent ice impact. But, on the other hand, oil spreads more slowly and forms much thicker equilibrium layers than it does on temperate waters. This allows more time for response and better pickup efficiency by skimmers. Ice features themselves act as effective barriers to oil spreading and tend to encourage accumulation in thicker layers. This accumulation is beneficial to clean-up operations because it permits oil to be burned almost completely.

Oil spilled on top of land-fast or pack ice should be easier to clean-up than a similar spill on water or land. Low temperatures, snow and crushed ice all act to restrict the flow of oil on the ice surface, and the impermeability of ice prevents the oil's downward migration. Both factors tend to isolate the spilled oil into thick pools of small areal extent. Thick layers of oil can be burned quite efficiently in open pits or with burners and incineration devices developed especially for this purpose.

Oil spill response technology for arctic environments has been and is presently undergoing intense research and development. As a result of this work, much of the technology is already available and more is in the development stage. ABSORB, an arctic oil industry response organization, will complete construction of the world's first ice-strengthened arctic oil skimmer in 1982. The vessel is designed to recover oil in open or ice-infested waters as well as on or under ice. ABSORB has also pioneered the development of an above-ground incinerator which can burn picked-up oil in a near smokeless fashion. The Canadian government and Canadian oil companies have jointly developed practical techniques for incinerating oil accumulated in, on, or against floating or shorefast ice. Chemical companies in the United States and Europe are studying new dispersant formulations and ways to apply them effectively and safely; this program promises to make chemical dispersion of oil an effective response strategy for use in cold waters.

In summary, existing and developing technology is adequate for responding effectively to an oil spill in the Norton Sound. In addition, precedent for drilling in similar areas has already been established by United States and Canadian regulatory bodies. After thorough review, these agencies have approved industry plans to operate in areas around the Colville, Sagavanirktok, and MacKenzie river deltas in the Beaufort Sea. These areas are similar in many respects to the Yukon delta region of Norton Sound.

FRIENDS OF THE EARTH

October 16, 1981

Esther C. Wunnicke, Manager
Alaska OCS Office
Bureau of Land Management
Anchorage, AK. 99510

Dear Ms. Wunnicke:

This letter, plus attachments, constitutes the comments of Friends of the Earth(FOE) on the Norton Sound Draft Environmental Impact Statement(DEIS).

FOE strongly recommends that this lease sale be delayed. This recommendation is based on several factors including industry's inability to contain and clean-up an oilspill in the Sound over much of the year; Problems associated with drilling relief wells; and the possible impacts a catastrophic oilspill could have on internationally significant fish, marine birds, marine mammals, and endangered species. Of particular concern to FOE are the possible impacts of this proposal on the villages of the Norton Sound region.

Delay of this sale would help to substantially minimize the effects of offshore activities when they do take place. A delay will allow time for industry to perfect drilling technologies and clean-up techniques. A delay will provide the government with the time necessary to perform needed studies and perfect mitigation measures. Most importantly, a delay will give the residents of the area time to prepare and plan for rational development in their region by completing and implementing local coastal management plans.

Our specific comments follow. They focus largely on the issues described above. If your office wishes additional information, please feel free to contact us. Thank you for considering these comments.

Sincerely,
David Benton
David Benton, Marine Resources Specialist

Alaska office, 1069 West Sixth Ave., Anchorage, Alaska 99501, (907) 272-7335

This is recycled paper

DEVELOPMENT ASSUMPTIONS

A basic assumption on which most of the development scenerios (and hence most of the impact assessment) are based, is that little or no oil will be discovered in the southern portion of the lease area(DEIS at 109). Several information sources cause us to seriously question this assumption.

First, there appears to have been quite a bit of interest in the central and southern portion of the lease area judging by the tract nomination/industry interest map. This map shows that areas where industry has a "high" degree of interest were about seven or eight miles from the Yukon Delta. "Medium" interest tracts extended all the way up to State waters. On the other hand, the nearest "high" interest areas to the north were about 18 miles from the coast.

Second, during the summer of 1981 the State of Alaska announced its proposed lease sale area for Norton Basin Sale No. 38. The State put out a call for nominations and request for public comment for the entire tideland area in the Norton Sound region. The only areas selected for further consideration, however, were those tracts located around the Yukon Delta and along the eastern coastline of Norton Sound. This also demonstrated that industry is quite interested in the southern part of the Sound.

Finally, the Calista oil and gas program, and DOI's own onshore leasing program have demonstrated that there is an interest in the Delta region.

The development assumptions in the DEIA fail to take these considerations into account. Because of this, the DEIS only addresses

a Nome-based development. There is no analysis of a southern-based development scenario. This is partly due to the background material (or lack of it) used to develop the basic assumptions -- ie: Socio-economic Study #49, titled Bering-Norton Petroleum Development Scenarios, a Dames and Moore report completed in January of 1980; and OCS Technical Report #1 by John Tremont.

With regard to report 49, it is evident that the authors of this report were well aware that it was based upon a lack of information:

> ". . . the assumptions used to generate scenarios may be subject to revision as new data become available." (Page 1)
>
> "In the course of this study, significant data gaps were revealed that imposed limitations on the scenario development and the related analysis listed above. These data gaps and related constraints should be kept in mind when considering the results of this study." (Page 5).
>
> "The data gaps to a large extent result from the fact that industry and regulatory interest and research is only now beginning to focus on the Bering Sea basins and Norton Sound in particular." (page 5)
>
> ". . . the principal data gaps include: oceanography . . ., petroleums facility costs . . ., (and) petroleums geography--insufficient interest and research is only now beginning to focus on the Bering Sea basins and Norton Sound in particular." (Page 5).
>
> "Field location in the scenarios is arbitrary but designed for impact assessment to provide a range of development cases that are shown to be economically and technically realistic options." (Page 9).

The report analyzes a high find scenario (see map on pages 114-15), a medium find scenario (see map on pages 140-41), and a low find scenario (map on pages 166-67). All of these scenarios assume that the oil deposits will be found in the northern part of the basin. However, a comparison of these maps with the actual tract selection in the federal sale reveals that few, if any, of the deposits speculated by Dames and Moore are even in the area that will now be offered for lease. Consequently, the assumption by Dames and Moore as to where commercial quantities of oil will be found may be at odds with present expectations. Nevertheless, the DEIS follows the Dames and Moore assumption that the southern tracts will contain no commercial quantities of oil, and that there will be no development in the south.

Technical paper #1, titled "Resources, Developmental Time Frames, Infrastructure Assumptions, and Block Deletion Alternatives for Proposed Federal Lease Sales in the Bering Sea and Norton Sound", written by John Tremont, continues the basic assumptions made by the Dames and Moore Report. Technical Report #1 was completed in April of 1981, yet seems to ignore the tracts which have been selected for leasing by the BLM/OCS office. This situation has led to serious flaws in the DEIS which must be corrected. The document must assess the impacts of a Delta-based (or at least southern Norton Sound) development scenario. Such an assessment must take into account the basic social, cultural, and environmental diffences between the regions. To do otherwise is to end up with a decision document which looks at only half the picture.

In addition, the above considerations also significantly affect the cumulative impact analysis for impacts on the Yukon Delta -- both environmental and social. This should be corrected as well.

Post Lease Regulatory Assumptions

The DEIS, on page 12, refers to several laws and regulations which would help to mitigate certain OCS impacts. These include OCS orders, coastal zone management regulations, etc. On page 101, the DEIS states that the document assumes that "all pertinent laws of the United States, including USGS Operating Orders for the OCS, would be in effect and would shape and mitigate certain impacts." However, the Bering Sea OCS OperatingOrders have not been completed yet, nor have draft copies of those Orders been available for review by the public -- neither in this EIS nor seperately.

Because of this, it would appear to be a questionable practice for this document to assume that the Bering Sea Operating Orders will be able to adequately mitigate the impacts of this sale. The Bering Sea Orders will have to address an incredibly large and diverse geographical area. Conditions range from the intense ice zones of the Bering Strait/Northern Bering Sea to the more temperate but storm tossed Southern Bering/Aleutian area. These Orders will have to address everything from extreme offshore/deepwater drilling to more nearshore/shallow water areas. This will be a complex task at best; and may be one of such enormity that only very general Orders will be produced.

If this is the case, then lease-area specific stipulations will play a key role in proper lease managements. Such area-specific regulations will be the only way to taylor operations to the lease area's unique conditions -- be that lease area Norton Sound or the St. George Basin farther south.

We can only question how this EIS can claim anything about these OCS Orders or their effectiveness when those Orders have not been available for review. The DEIS does refer to the Arctic and Gulf of Alaska Orders as good examples of what to expect. Still, the respective geographical areas covered by these two sets of Orders can not match the diversity of conditions found in the Bering Sea, a diversity which will have to be addressed by one set of regulations.

However, if comparisons are to be made, then the Arctic Order -- and the operations they have affected to-date -- provide the best exampl for Norton Sound. These Orders were carefully drafted by USGS, and constitutea relatively good job. Some problems do still exist*, however -- for example: the Orders do not require state-of-the-art continuous directional surveys(these are important for locating the wellbore in the event that a relief well is needed); they don't give specific requirements for relief well drilling; and they only address certain emergency situations-- such as loss of the drilling rig (due to ice) or loss of support craft, etc. -- superficially. In addition, implementing the best available and safest technologies (BAST) requirements of the OCS Lands Act has been a question nobody has been able to satisfactorily answer at this time.**

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*See comments by State of Alaska on proposed Arctic OCS Orders, 1/16/81, attached; and comments F. O. E. on Arctic OCS Orders, 1/19/81, attached.

**The BAST requirement may prove to be extremely troublesome in the Berin Sea. Equipment which might satisfy BAST in the northern Bering Sea might be inappropriate in the south and vice-versa.

Still, these problems can concievably be remedied through careful drafting of the regulations. What can't be remedied however, is administration of those regulations. This is a problem not addressed in the DEIS which bears a great signifigance to the overall effectivenes of these Orders and hence their effect on mitigating this lease sale's impacts.

So far, the Exploration Plan for the U. S. Arctic to go through the review process is the Exxon OCS--1-0191 #1 plan for the nearshore Beaufort Sea. Others are pending. Several problems came up during review of this plan*, including:

--getting adequate access to the Plans and accompanying studies. In this instance USGS refused to send copies of the Plan to the affected villages and it was left to FOE to do this. Such actions make it extremely hard for local people to review these documents;

--failure to address the emergency situation identified in Order No. 2;

--failure to incoporate state-of-the-art clean-up techniques. In this case, the use of a frozen-in containment curtain;

--lack of an adequate inventory of clean-up equipment; and

--lack of a detailed relief well drilling plan. This latter point is of special concern. The Exxon plan estimates that it will take a minimum of 98 days(14 weeks) to drill a relief well under the best of conditions. If this were to take place in Norton Sound, it could result in large quantities of oil being spilled.

The Plan was conditionally approved by USGS pending correction of some of the above problems. However, as the state's letter of 10/1/81 reveals,many of these problems remain, yet the plan recieved ACMP approval. USGS approval is expected shortly.

This points out the basic flaw in the assumptions made in the DEIS that these laws and regulations will provide effective post-lease management. There is no guarantee that this will take place.

It is this type of problem which is one of the underlying basis for delaying this sale until the Norton Sound area coastal management plans(ie: Bering Strait and Yukon/Kuskokwim Delta regional CZM plans) are ready to be implemented. Only then can local people get directly involved in the management process via the consistency review process. In assessing the delay option, and in reviewing the effectiveness of post-lease managment and enforcement, the DEIS fails to address these considerations. As it now stands, the assumptions used in the DEIS could significantly bias the document's overall impact assessment.

*Please see comments on this plan: FOE letters to USGS dated 2/1/81 and 9/2/81; and State of Alaska letter dated 10/1/81. Attached.

Oilspill Risk Analysis

The DEIS uses oilspill statistics from the U.S. OCS to evaluate the probable risk of oilspills posed by Sale 57. This practice has been challenged by the oil industry which points to the Cook Inlet experience as a more realistic model of what to expect. The gist of their comments is that there is little likelihood of a apill in Norton Sound.

This is reminicient of similar claims made by industry concerning the joint Federal/State sale in the Beaufort Sea. In the case of the Beaufort however, industry rated the probability of a blowout (not necessarily an oilspill) at roughly 1 in 1 million.* This figure apparently came from a study done for the Canadian Environmental Protection Service, entitled Probabilities of Blowouts in Canadian Arctic Waters, by F.G. Bercha and Associates Lts., (1978). The study found a probability for a blowout of 5,000 barrels/day or greater to be about 1 in 1 million.

Industry argued long and loud that this clearly demonstrated that the probability of a blowout in the Beaufort was virtually nil. Yet the facts did not back this up. Industry failed to point out that this figure was not the probability for the life of a field, but was rather the probability of a 50,000 barrel blowout (Bercha Study at 104). Estimates for a large oil blowout over the life of the field were considerably higher, roughly 1 in 400 (Bercha study at 114).**

Industry also failed to point out that Canadian projections for smaller blowouts were much greater... 1 in 50,000 per well if greater than 5000 bbl; 1 in 12,000 per well if greater than 500 bbl; 1 in 1,500 per well for any type of blowout.

Cook Inlet production levels are such that they are statistically insignificant at present.

Because of these considerations, we would urge extreme caution in relying on industry's information regarding the risk involved with Norton Sound OCS activities. Surely, other factors enter into the question.

For example, USGS Open-File report 80-101 providea information on blowouts which occurred on the U.S. OCS. During an eight year period (1971-78) 46 blowouts occurred, for a rate of 1 blowout for every 250 wells drilled. Seventeen of these blowouts involved exploratory wells, eight of which occurred while drilling from jack-up rigs. On two occassions this resulted in totsl loss of the jack-up units involved.*

The importance of this information must not be overlooked. The accident rate, as indicated by blowouts, is significant for OCS activities. The possibility also exists that one of these accidents will result in a major oilspill. The DEIS assumes that the level of risk is directly proportionate to the amount of oil produced. This may very well result in BLM significantly underestimating the level of risk for this lease area. Very little oil had been produced out of the North Sea at the time of the Ecofisk blowout, the same is true for the Mexican offshore at the time of the Ixtoc blowout.

Therefore, while it may be true that the spill rates for pipelines and tankers is proportionate to oil production, it is not necessarily true for rig accidents. The DEIS fails to consider this and thus raises an important point; the point being that an oil blowout can occur before production, and that if such an occurrence were to happen in Norton Sound it could have catastrophic results.

* See SOHIO-BP's Questions and Ansers, Beaufort Sea Lease Sale, May, 1979; AOGA's Arctic Offshore, Sept., 1980; and Beaufort Hearing Record.

** See Opposition Brief of Appellees, Village of Kaktovik et al, in North Slope Borough et al. vs. Hammond et al. in the Supreme Court, State of of Alaska.

* This is particularly relevant to Norton Sound where jack-ups will most likely be the type of rig used during explorstion. Although most of the accidents to-date involve gas, the possibility still exists for a large oil blowout. This could be a catastrophic event and argues strongly for the area-wide seasonal drilling restriction discussed elsewhere in our comments.

These estimates for operations over the life of a field were 1 in 400 for a "large oil blowout"; 1 in 20 for an "oil blowout"; and 1 in 3 for a blowout of any type.

Moreover, because of basic errors in methodology used in the Bercha Study, their projections may have been grossly underestimated. The Bercha study relied on the "fault free" technique for assessing risk. This methodology is reliable only if quantitative reliability data is available for individual components. Where such data is not available, use of this technique often leads to an assessment of risk which is underestimated.* Because of the limited nature of Canadian operations, such data waa largely unavailable. This data gap is the logical exploration as to why blowouts estimated at a likelihoood of 1 in 1,500, have occurred with relative frequency in the Canadian Beaufort.

As of July, 1980 Dome Petroleum's drillship operations had three high pressure water and/or gas blowouts in roughly 10 spuddings. An actual incidence rate 100 times greater than predicted. If the Bercha estimates were adjusted to correspond to this statistically limited Canadian experience, the chance for a blowout is about 1 in 4.

Finally, a quick review of the industry's Cook Inlet information reveals two things:

1. Their data atart in 1975, after several incidenta which would affect their spill estimates, including at least 1 pipeline break. The Alaaka Oil and Gas Conaervation Commission is currently compiling information on Alaakan spilla and this should provide more information along this line; and
2. Using basic statistical calculations, there appeara to be about a 34% chance that there is no difference between the U.S. apill rate and the Cook Inlet apill rate. This is mainly due to the fact that

* For an in-depth diacussion of thia see One Chance in a Million, a paper presented by D.J. Gamble and C.T.L. Jansen at the Fourth Annual Technical Seminar of the Arctic Marine Oilspill Program, Edmonton, June 16-18, 19[illegible]. A copy ia attached.

ENDANGERED SPECIES

The DEIS fails to seriously look at the possible impacts of this lease sale on the highly endangered bowhead whale. Some of the impacts the document must address include:

--impacts on overwintering areas. Bowheads overwinter along the ice-edge front south and west of the lease area(DEIS at 74). Any pollutants generated in the Norton Sound/Bering Strait region during the winter have a good chance of being transported to this area. For example, as we have pointed out in our comments on the seasonal drilling restriction, there is a reasonable possibility that a blowout (if it were to occur) could flow over the course of an entire winter. We also demonstrated that ice movement could transport spilled oil out of the lease area towards the ice front*, and that such oil would remain largely unweathered. Such an event could pose a significant threat to the bowhead.

--impacts during spring migration. Similarly if a blowout were to occur as described above there is a strong likelihood that oil would be impacting bowhead during spring migration. During the spring, wind and ice directions change so that net transport shifts to the north. Oil (or other pollutants) spilled at this time could begin moving towards Bering Strait. In addition, oil trapped in the ice would be released as melting occurred throughout the ice sheet. The lead system at Bering Strait and north into the Chukchi can be very

*For an additional discussion of ice transport, see Natural and Geologic Hazards:Physical Considerations for Offshore Oil and Gas Development in Norton Sound, Alaska, by Richard B. Duncan.

constricted at the time of bowhead migration, and there is a good chance that any oil reaching this area would come into contact with these whales The DEIS should more-fully explore this possibility.

--impacts during fall migration. The DEIS barely deals with the fall migration of bowhead whales. Once again, using our example of a blowout late in the drilling season, what would be the effects on the southward migrating bowhead?

The above questions deal with a catastrophic event. Often such events are lightly dealt with because of perceptions that they are unlikely. FOE acknowledges that for a given well such an event may be unlikely, but for the life of a field this probability increases dramatically(see our comments on oilspill risk). FOE contends that, due to the technological constraints on relief well drilling* and oilspill containment/clean-up, the effects of such an event must be carefully assessed for a variety of conditions.

Similarly, the DEIS is silent about important considerations regarding gray whales. The most obvious deficiency centers around the DEIS's failure to assess the central role of the Yukon River sediment plume as a major nutrient source for the northern Bering and Chukchi Seas. They account inpart for the high productivity of the Bering Strait and the Chirikov Basin. Because these areas are of paramount importance for gray whale feeding, this deficiency is of particular importance.

If a spill were to occur at the Yukon Delta, oil could become entrained into the sediment plume. Adherence of oil to sediment particles would cause sinking of the oil spill resulting in oil becoming incorporated into Norton Sound bottom sediments. This presents the very real possibility of long term pollution of such areas as Chirikov Basin. Once incorporated into bottom sediments, oil degrades very slowly, and resuspension of sediments can result in re-introduction of highly toxic hydrocarbons.

This could have a dramatic impact on gray whales(and walrus which also feed extensively there) by reducing prey abundance, by changing species composition, and by contaminating what prey remains in the area. Moreover, it is now thought that gray whale foraging is a major mechanism for sediment resuspension(this is also true for walrus to a degree). If gray whales were to forage in areas of contaminated sediments, then the effects(such as baleen fouling) would be even greater.

Although the DEIS touches on this point, it does not do so in the context of Yukon Delta sedimentation processes. Oiling of sediments will affect the flocculation characteristics of those sediments, which will affect the bouancy of sediments, which will in turn affect sediment distribution. Major contamination of sediments could have a profound effect on the Norton Sound/Bering Strait ecosystem, could significantly affect significant marine mammal and bird populations, and most importantly could affect major portions of the world's population of gray whales and walrus.

*Our discussion of relief well drilling deals only with the exploratory phase. Similar problems may exist with the production phase. Production wells will probably be drilled from bottom-founded gravity structures. These platforms are not highly mobile(to say the least). In the event of a production blowout during winter, how would industry drill a relief well? Certainly not with a jack-up.

As a final comment we must note that the DEIS largely disregards the issues of formation water discharge and the disposal of drilling muds. The matter of long term chronic discharges(small spills) is also ignored. These discharges can mount up to a considerable amount over the life of a field. For example, in the Beaufort Sea an estimated maximum of 112,500 barrels of oil would be introduced into the environme by formation waters alone(Beaufort EIS Table III. A. 3-1). No estimates for formation waters or drilling mud volumes are provided in the Norton DEIS, and no analysis is made of the long term impact of these pollutants on the endangered whales found in the lease area. This would include long term impacts of sediment contamination(by chronic discharges) on gray whales and their prey; and an evaluation of long term impacts of habitat degradation(especially overwintering habitat) on bowhead whales.

WORST CASE ANALYSIS

Review of the DEIS reveals a high degree of uncertainty regarding the impacts of OCS activities on marine mammals and endangered whales.* For example:

--Oil pollution and disturbance due to increased human activity could affect marine mammal populations found in the proposed sale 57 area. It is difficult, if not impossible, to accurately predict on a long term basis how interaction of such factors may affect each mammalian species found in or near the proposed sale area. DEIS at 162.

--According to these workers(Geraci and St. Aubin, 1980) critical knowledge regarding avoidance of oil by marine mammals is clearly lacking. Thus, although likely for some species, it is not clear as to the extent to which abandonment of habitat due to short term, small (or large) oilspill presence would occur. DEIS at 164.

--The ultimate direct effects of low level, chronic oil contact on marine mammals are not readily predictable. In fact, it has been suggested that long term effects can only be assessed under field conditions(Geraci and St. Aubin, 1979 and 1980), primarily through monitoring efforts. DEIS at 164.

--The effects of gas condensates or gas vapor inhalation on cetacear are unknown. DEIS at 178.

*As part of our comments on the DEIS, FOE submits the report-The Effects of OCS Development on Certain Pinnipeds of the Bering Sea, Josephs, 1981. copy attached

--However, it is not possible to predict eventual population response on endangered whales as a result of baleen fouling at this time. Effects of bioaccumulation of toxic substances in cetaceans are not well understood. DEIS at 178.

--Research on effects on noise, particularly that associated with oil operations on endangered cetaceans has been limited. DEIS at 179.

--The extent to which disturbance due to oil and gas exploration and development in the proposed sale area would act as a stressor is uncertain, and any prediction of the extent of stress-related impacts of noise would be premature. DEIS at 181.

This level of uncertainty, coupled with the problems mentioned above, demonstrate strongly that a worst case analysis should be included in the DEIS. CEQ regulations require such an analysis in cases where substantial uncertainty exists concerning the potential adverse impacts of proposed actions. The DEIS should analyze the possible consequences of a major or catastrophic spill, as well as long term habitat degradation. The analysis should be based on the particular sensitivity and productivity of the region and the ability or inability to clean-up a spill under a variety of conditions, including storms, presence or absence of sea ice, distance from shore, etc.

As part of the worst-case analysis, the EIS should discuss the following:

--Those endangered species known to occur in the area and whether a worst-case situation could lead to a threat of extinction of both the local population and the species, with particular attention given to critical stages and habitat in each species' life cycle;

--For non-endangered marine mammal species, a similar analysis focusing on percentage depletion of the species, and recovery time;

--For subsistence and commercial fish, the possible losses (including economic) and recovery time from a large spill directly contacting the area;

--The consequences of two or more spills coming into contact with the same vulnerable resource, noting that a second spill may cause greater damage than an initial spill of similar volume (because an ecosystem, or a species population, may tend to be more vulnerable if it is still recovering from effects of the first spill). Particular attention should be given to the effects on highly migratory species which pass through several lease areas. For example, the bowhead whale, an endangered species whose entire range is scheduled for leasing;

--A "cumulative worst-case" analysis based on the assumption that two or more worst case scenarios come to pass in different lease areas.

MITIGATION MEASURES

1. Orientation Program.

We support the concept of the orientation program so long as it is sensitive to local conditions and the goals of local residents. In order to ensure this, we recommend that the program be designed in cooperation with local representatives from the Norton Sound area. In addition, we must point out that the DEIS placestoo much emphasis on the effectiveness of this measure as a technique for preventing spills, reducing the impacts of chronic pollutant discharges, etc. The orientation program is described as a major mitigative technique for minimizing social impacts as well as impacts to birds, salmon, herring, crab, bottomfish, and marine mammals. Such expectations are obviously unrealistic. This measure simply is not an adequate substitute for explicit stipulations which address specific problems. The DEIS should make the limitations of this measure clear.

2. Transportation of Hydrocarbon Products.

This measure, has become a standard lease stipulation for OCS activities. However, language should be added which would ensure that the free passage of migratory birds, fish or marine mammals. In the event that causeways are used, long continuous-fill causeways should be prohibited.

3. Seasonal Drilling Restriction

On page 16 the DEIS proposes a seasonal drilling restriction which would allow exploration to occur only through the period of June 1 through October 30. Unfortunately, the effectiveness of this measure is significantly impaired because it only applies to 93 tracts in the extreme southwestern portion of the lease area.

This stipulation should apply to all tracts in the lease area. Serious problems exist with industry's ability to drill a relief well or effectively contain contain or clean-up an oilspill in Norton Sound--especially in the winter. These problems clearly indicate the need for this area-wide measure.

For example, it is generally agreed that exploration of the lease are will be carried out in Norton Sound by jack-up rigs (DEIS at 101). Because jack-up rigs are not ice resistant, exploration will most likely be confined to the open water season (roughly late May through mid-to-late October)*. This presents a serious problem regarding relief well drilling in the event of a blowout. A blowout is most likely to occur near the end of a drilling program when the well is deep, where pressures are greatest, and oil is most likely to be encountered. In Norton Souhd, if a blowout were to occur late in the drilling season -- say October 30 -- there is a strong likelihood that there may not be enough time to drill a relief well before ice mores into the lease area.

A recent estimate of relief well drilling time can be found by looking at Exxon's Exploration and SPCC plans for Beaufort Sea OCS-Y-0191 #1. On page 76, Exxon summarizes the time required to drill a relief well in this area. Assuming "trouble free operations, without extraordinary problems", the shortest time frame is 14 weeks (98 days). Thirty-one days of this are spent building a gravel pad and trucking the rig onto location -- activities which would not be required in Norton Sound assuming the use of jack-up rigs. Sixty-seven days are needed to drill the relief well and shut-in the blowout.

* The exception would be the use of gravel islands in the shallow waters located mostly in the southern part of the lease area. However, the immediate use of gravel islands appears to be unlikely because of a lack of easily accessible gravel supplies.

In the case of our example -- i.e., an October 30 blowout in Norton Sound -- this would put the relief well operation into late December.*

The significance of this is self-evident. Freeze-up usually begins in Norton Sound in early November. Therefore a jack-up rig would have to be out of the area long before a relief well could be completed. This means that the blowout could flow uncontrolled for 8-9 months (untill the following summer) before relief well operations could commence.

GRAVEL ISLANDS

Similar problems exist if gravel islands are used in Norton Sound. If a blowout occurs on a gravel island, a relief well may have to be drilled. If this were to occur during the open water season, a jack-up might be used to drill the well, but this would depend on the time of year, water depth, rig availability, etc.

If a jack-up were unavailable, or if the blowout occurred during the winter ice season, then the relief well would most likely be drilled from a gravel island. In this case, Exxon's OCS-Y-0191 #1 plan gives an example of what to expect, although there are some important exceptions.

First, it is generally accepted that relief wells for gravel island blowouts will require constructing an additional gravel island adjacent to the blowout. This is at least partly due to industry's unwillingness to construct gravel islands large enough to accomodate both the exploratory well and a relief well if necessary. Construction of the additional gravel island will, of course, take time. In the case of the Exxon well in the Beaufort, this was 21 days.

For Norton Sound this time frame is probably too short. The Exxon well is adjacent to the Prudhoe Bay complex. The well is relatively close inshore, and the operator has ready access to an impressive inventory of heavy equipment, a well developed gravel supply, and an extensive road system for moving equipment and materials. This is not the case in Norton Sound. Most of the lease area is relatively far offshore, equipment will be less readily available, gravel will probably be in shorter supply, and transport times will be greater due to distance and the lack of infrastructure.

Furthermore, it should be remembered that the Exxon well is in the very stable landfast ice behind the barrier islands. Most of the Norton Sound lease area is outside the landfast ice zone. The dynamic conditions of Norton Sound pack ice may effectively preclude any gravel island construction until the following open water season when barges could transport the gravel. In this case, the blowout could also flow for several months before being brought under control.

In either case (i.e., jack-up or gravel island) an October 30 cutoff for all downhole activities would be an effective mitigating measure. Downhole testing would have to be completed prior to October 30, and drilling activities would take place even earlier in the drilling season. Thus, there would be a much greater likelihood of shutting down a blowout if one were to occur.

A second consideration involves oilspill cleanup. Oilspill containment and clean-up in Norton Sound is going to be a difficult and often impossible task. For the open water periods, most of the

* This does not take into account the time it will take to locate a rig and move it to the relief well site. It is assumed that all available rigs will be drilling wells, and that a certain amount of time will be consumed by shutting down and moving the rig. This could add more delay.

equipment presently available is effectively limited to operations in seas of a maximum of about 6 feet in currents of about 1-2 knots. Recent modifications may have expanded this capability somehwhat (to 8 ft. seas), but application of such equipment is largely untested. Under ideal conditions conventional clean-up equipment cannot provide much more than a 50% removal efficiency, yet conditions in Norton Sound frequently exceed the design limits mentioned above. As such, the estimates for open-water clean-up efficiency presented in Appendix K are unrealistic. *

Logistics will be another serious problem. Mobilization and deployment of oilspill containment and clean-up equipment will be difficult and time consuming. There are only three airstrips capable of accomodating large transport planes (Nome, Unalakleet, Moses Point), and only one port capable of unloading heavy cargo (Nome). If a spill occurred near the center of Norton Sound it would take a vessel out of Nome about 5-7 hours to reach the spill site. This does not include the time required to load gear and personnel. If a spill were to occur in the eastern or southern portion of the Sound, transport times could approach 10 to 14 hours.

Furthermore, if a large spill should occur, personnel and equipment (some coming from as far away as Anchorage and Seattle) would necessarily have to be unloaded in Nome or Unalakleet and be ferried to the spill site by small aircraft, helicopter, or small boat. This will greatly increase the amount of time required to respond to a spill, especially if adverse weather conditions do not permit the use of such modes of transportation. Under such conditions it might require several days just to transport personnel and equipment. During the winter months, short days, cold temperatures, and the presence of sea ice may add additional delays.

Winter clean-up operations will be even more difficult. Sea ice is normally present in Norton Sound 6 to 8 months out of the year. The effectiveness of most open water containment equipment will be drastically limited once ice concentrations exceed 10 to 20 percent. Although oil removal operations could conceivably continue in the presence of brash or pancake ice, it is probable that the efficiency of clean-up operations will be greatly reduced. Also, safety factors under such conditions may render clean-up operations impossible.

With higher ice concentrations, spill containment and clean-up becomes even more hypothetical. Oilspill response scenarios presented for the Beaufort Sea by the Alaskan Beaufort Sea Response Body (ABSORB) describe clean-up operations aimed largely at spills in the shorefast ice zone. Shorefact ice in the Beaufort Sea is thick and reasonably stable. This permits the use of heavy equipment to construct containment structures such as snow berms or trenches, and for physical collection and removal of oil spilled on top of ice.* In Norton Sound, both the strength and extent of shorefast ice is very limited, with most of the lease area outside the shorefast zone.

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* This is particularly true for areas such as the Yukon Delta where industry estimates 75% recovery rate. This optimism is in direct contradiction to the findings of the draft Norton Sound Synthesis Report. After reviewing the extensive spill transport mechanisms at work in the Delta, the report concluded the "clean-up of a spill in the delta area does not appear practical."

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* The techniques described by ABSORB in their Oilspill Manual mainly address oil spilled on the ice. Spills under the ice, or in moving ice are still a serious problem.

Because of this, clean-up techniques such as those described by ABSORB for the Beaufort Sea will be impossible to use for much of Norton Sound.

Problems exist with the Winter response scenarios presented by industry in Appendix K as well. For example, the under ice oil-spill scenario assumes that oil would concentrate under the broken ice pack. Personnel would drill holes and dig trenches in the ice to further concentrate the oil which would then be burned. According to industry, in situ burning coupled with "secondary recovery/ flushing techniques" (not discussed in the DEIS) would yield a 50% to 75% recovery rate.

Such assumptions are unreasonably optimistic. Evidence from the Kurdistan spill off Cape Breton (one of the few large spills observed in broken pack ice) indicates that the natural tendency for oil spilled in pack ice is towards dispersion and dilution. One of the primary dispersion processes was the grinding of oil in brash ice as a result of floe impact and movement. In the offshore pack, swell propagation caused a leisurely grinding motion which produced oil particles ranging from a few centimeters in diameter down to micron sizes.

A secondary process which also tended to disperse the oil occurred as a result of solar heating on snow/ice surfaces. The ice beneath blobs of oil would melt, causing the oil to be stretched and spread until surface tension effects intervened to produce micron sized oil particles. Individual particles showed no sign of strong adhesion to the ice, and in many cases became trapped as new ice formed over those particles which had become concentrated in melt pockets. Due to this tendency towards dispersion burning would have been completely ineffective and was not attempted.

Research evidence also points to several mechanisms whereby oil would be incorporated into the ice pack. For example, oil migrating into open leads will be compressed to greater film thicknesses, and longitudinal flow along the leads will occur from areas of thick oil to unoiled portions of the leads. This process will continue until obstructions in the leads cause the oil to overflow onto the surrounding ice. Since the ice is in continual motion with leads progressively opening and closing, the oil could be pumped through a branching network of leads from the area originally contaminated to uncontaminated areas considerable distances from the spill site. This would cause further dispersion of the slick into the ice pack.

When leads close completely the ice on either side of the lead may be deformed into pressure ridges. Before the lead closes, the bulk of the contained oil can be expected to spill over onto the surrounding ice. As the ridge then forms, the oiled ice will be broken up and incorporated into the ridge itself. In this manner oil may become entrapped in the ice thereby effectively preventing any immediate clean-up, and allowing the oil to be reintroduced into the marine environment at a later date when the ice subsequently melts.

Large scale transport of oil in ice is a very real possibility in the Bering Sea. Pease (1979) compares ice generation and transport in the Bering Sea to the mechanic operations of a "conveyor belt". Ice develops in the northern and coastal regions of the Bering Sea, subsequently advects in a south-southwesterly direction, melts along the southern margin of the ice pack, and is replaced by new incoming ice.

In this manner, the Bering Sea ice pack is believed to replace itself roughly eight times during the course of a winter. Thus, oil trapped within growing ice in Norton Sound could be transported and released several hundred miles away.

The implications of oil capture and transport are significant when the physical aspects associated with such events are considered. Oil trapped in ice does not weather substantially, instead it retains much of its original toxic components, which can then be later released as the ice disintegrates. Processes normally associated with weathering such as evaporation, dissolution and biodegradation may still occur, but will be extremely restricted. Thus, oil transported in this manner could affect important biological resources and habitats hundreds of miles from the spill source.

This presents a grave threat to the extensive marine bird and mammal populations which inhabit areas south of Norton Sound, especially the ice-edge front. A winter spill in Norton Sound could be transported to crucial overwintering areas for birds, seals, walrus, and bowhead whales. As break-up proceeded in the spring, this oil could concentrate in leads and other open water systems which are extremely important to migratory marine mannals and birds. This presents an unwattanted threat to internationally recognized biological resources. A seasonal drilling restriction would help to minimize this problem by reducing the possibility that a winter spill would occur.

4. Area of Special Concern.

This measure is intended to mitigate OCS impacts on the Yukon Delta. As it now reads, the protection this measure provides is inadequate. It does not address blow-outs, rig fires, or pipeline breaks, all of which could result in levels of oil pollution much greater that those posed by storage or loading operations. This measure should be expanded to require extra precautions to prevent blow-outs, rig fires, pipeline breaks, etc. The measure should also include certain provisions outlined by the draft Norton Sound Synthesis report for mitigating OCS impacts on the Yukon Delta, including:

-- No support, loading, or transfer facilities on the delta or within 60 km. of its shore; and that

-- A storm surge model be developed and used to control OCS activities just as the hurricane warning system is used in the Gulf of Mexico;

The storm surge warning system should be developed, tested, and operative prior to production.

In addition, the "Information on Oilspill Contingency Plans" contained in the "Information to Lessees" section of the DEIS (pg. 20) should be incorporated into this stipulation, with a requirement for special oilspill continency measures to protect the Delta. This should include a requirement for a positive, in-the-field demonstration by industry that effective oilspill clean-up under the ice or on wet tundra.

5. Information on Bird and Marine Mammal Protection.

This measure is proposed to be included in the Information to Lessees. As such, it is mearly advisory in nature, providing little or no quarantee of compliance. In fact, as it now stands this measure may promote harrassment by identifying marine bird and mammal concentration areas. To avoid this, and to ensure protection of these resources, the substantive requirements of this measure should be incorporated into a lease stipulation. Enforcement could be accomplished by informing the lessees in the Notice of Sale that failure to comply with this measure would constitute a breach of contract and could result in suspension of the lease.

6. Information on Subsistence Activities.

Similarly, the "Information on Subsistence Activities" provides little or no direct protection of subsistence resources or activities, and is not an adequate substitute for stipulations which do provide that protection. Subsistence resources can best be protected by incorporation efffective stipulations into the lease sale (such as the seasonal drilling restriction, special measures for oilspill clean-up, etc.). Subsistence activities can best be protected by incorporating a stipulation which prohibits undue interference with subsistence activities. As with No. 5 above, compliance could be encouraged by informing lessees that leases could be suspended if undue harrassment were to occur.

7. Additional Mitigation Measures.

The DEIS overlooks several important potential mitigation measures. All of these were proposed at various times during the Norton Sound scoping process. They are discussed below:

A. Test Structure. Prior to year-round drilling activities outside the landfast ice zone, a test structure should be required. The test structure should be of the type as those structures proposed for the year-round activity. The test structure should be in-place two years prior to allowing year-round drilling.

B. Relief Well Drilling. Prior to any drilling activity the industry should be required to show conclusive proof that they have the ability to expeditiously drill a relief well. For the open water drilling season, this means before ice conditions render drilling unsafe. For year-round activities, this would include relief well drilling at any time of the year under any conditions found in the lease area. If the industry could not demonstrate this activity, then drilling permits should not be issued. For discussion purposes, an "expeditious" relief well action would be 45 days total.

C. Oilspill Clean-up. Prior to year-round drilling, industry must be required to conclusively demonstrate the ability to clean-up oilspills under all conditions found in the lease area -- particularly moving sea ice. Such a demonstration would include actual field tests of equipment and techniques. Currently, most of these are hypothetical techniques which have not been field tested.

D. Discharge of Drilling Muds. The discharge of drilling muds should not be allowed in waters of 10 meters or less in depth. The discharge of drilling muds and the chemical additives often used to combat specific drilling problems can be acutely toxic to fish and marine invertebrates. The most commonly used components of water-based muds are barite, caustic soda, bentonite clays, and lignosulfonates. Of these, soda and lignosulfonates are usually considered the most toxic. Ferrochrome lignosulfonate, a heavy metal compound, may be freed by chemical reactions when released into the marine environment, resulting in contamination of of surrounding waters and possible toxicity to aquatic organisms. Heavy metal contamination can affect living organisms or ecosystems by changing the species composition in the area where the effluent is

discharged, disrupting the biological systems of individual organisms, or accumulating in members of the food chain until the predators in higher trophic levels are affected (AFDG 1981). In drilling the Northon Sound COST well, chrome lignosulfonate in concentrations of 18,000-24,000 fluid parts per million were present in the mud mixture used (USGS, 1981).

Caustic soda is used primarily to reduce bacterial growth in drilling mud by maintaining a high PH (Dames & Moore, 1978). Studies have shown that caustic soda is lethal to various aquatic species in concentrations of 70 to 450 ppm. Falk and Lawrence (1973) recorded the LC50 for rainbow trout exposed to caustic soda at 105 ppm. Muds used in drilling the Norton Sound COST well contained caustic soda concentration mixtures of 600-5,000 fluid parts per million (USGS, 1981).

In addition, drilling muds may contain other chemicals such as emulsifiers, viscosifiers, thinners, preservatives, etc. Most of these chemicals are used to address specific drilling problems and are often associated with deep wells. Many of these compounds are highly toxic at concentractions as low as .06 ppm. for certain bactericides. Trivalent chromium salts which are generally used concurrently with XC polymers in drilling fluids are toxic to aquatic life at 0.3-1 ppm. Hexavalent chromium, a major source of aquatic toxicity in drilling fluids, can occur in concentrations of up to 450 ppm in mud, and is harmful to aquatic biological systems at concentrations of 0.1 to 0.4 ppm (Land, 1974 cited in AFDG 1981).

In Norton Sound, habitats which could be particularly sensitive to drilling muds include herring spawning and over-wintering areas, eelgrass and kelp beds, and nearshore feeding and rearing areas for juvenile salmon. In addition, because of poor circulation, nearshore waters inside the 10 meter depth contour are considered particularly sensitive.

Based on these considerations, we strongly recommend that a stipulation be placed on the lease sale which prohibits discharge of drilling muds anywhere within the 10 meter depth contour. We also recommend that the stipulation require that mud disposal areas must be designed and located in a manner which will prevent drilling muds from being carried or leached into the highly sensitive habitats mentioned above.

E. Discharge of Formation Waters.

The discharge of formation waters from offshore platforms or onshore treatment facilities could also seriously affect fish and marine invertebrates. Formation waters may contain up to 50 ppm of oil as small droplets and up to 35 ppm of dissolved hydrocarbons, primarily aromatic fractions (Koons et al., 1977). They may also contain toxic quantities of heavy metals, such as vanadium and mercury, and hydrogen sulfide, a poisonous gas. All formation waters are anoxic, and the concentrations of dissolved salts may vary greatly from those of the surrounding waters.

Organisms react in various ways to these different contaminants. Soluble hydrocarbons, heavy metals and hydrogen sulfide, even at low concentrations, are known to be toxic to marine life. Soluble hydrocarbons can have serious effects on larval fish and shellfish at very low concentrations (1.0 ppm or less). Non-hydrocarbon constituents of formation waters can also cause various adverse effects on fish and other marine life. For example, ammonia, a constituent of formation water, produces gill enlargement in fingerling king salmon. Mercury, another heavy metal found in formation water has been shown to concentrate in fish in excess of 10,000 times the amount present in surrounding water. The heavy metal lead, in concentrations of 0.3 ug/l impaired the reproduction of zooplankton, particularly, Daphnia major (NERBC 1976).

In addition the pollutants contained in formation waters may present a serious long-term, chronic threat to Norton Sound. For example, the oil in formation waters can adhere to sediment particles in the water column and settle to the bottom causing contamination of the bottom substrate. When accumulations reach a sufficient level, destruction of bottom communities occur. This suggests that although the concentration of oil in water may be low, oil may be accumulating in bottom sediments over a long period of time.

Similar problems may exist for heavy metals and other pollutants.

Because of the potential for serious long term impacts the discharge of formation waters should be prohibited in the entire lease area by stipulation.

F. St. Lawrence Island Special Area Designation

St. Lawrence Island stands a high probability of being impacted by a spill if one were to occur. Special protective measures similar to those prescribed for the Yukon Delta should be implemented for the island.

8. Norton Sound Task Force.

In addition to the above stipulations, a Norton Sound Task Force should be established for the purposes of monitoring exploration and development activities in the lease area. The Task Force should include agency representatives from the Bureau of Land Management, the U.S. Geological Survey the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and two representatives from the Norton Sound area. The two local representatives should consist of one person from each of the two Norton Sound subregions -- i.e., one Yukon Delta representative and one from the Bering Strait region.

The purpose of the Task Force would be to monitor post-lease activities. For example, the Task Force would review exploration and development plans, oilspill contingency plans, ongoing OCSEAP and BLM research programs, etc. The Task Force would also evaluate the effectiveness of lease stipulations, OCS orders, and other regulations. Proper enforcement of lease stipulations and OCS orders would be of particular importance. Recommendations would be made directly to the appropriate agency (i.e., USGS for lease stipulations, review of exploration plans, etc, OCSEAP or BLM/OCS for studies), and all recommendations would be accorded great weight in that agencies determinations. The Task Force should hold regular meetings which would be open to the public. The composition and duties of the Task Force should be discussed in detail in the EIS, and formally described in the Notice of Sale.

Attachments to Friends of the Earth comments on
the Norton Sound Draft Environmental Impact Statement:

Letter to Rodney Smith from David Benton dated 1 February, 1981

Letter to Rodney Smith from David Benton dated 2 September, 1981

Letter to Robert K. Riddle from James M. Souby dated 1 October, 1981

Letter to Craig Tillery from C.T.L. Jansen and article "One Chance in a Million" by C.T.L. Jansen and Don Gamble

Letter and Comments to Robert L. Rioux from Mike Whitehead dated 16 January, 1981

Report: Natural and Geologic Hazards: Physical Considerations for Offahore Oil and Gas Development in Norton Sound, Alaska, by Richard B. Duncan

Report: The Effects of Outer Contintental Shelf Development on Certain Pinnipeds of the Bering Sea, by Hugh Josephs

Letter to U.S. Geological Survey on the proposed Arctic Operating Ordera from David Benton dated 19 January, 1981

Getty

Getty Oil Company 6750 West Loop South, Suite 400, Bellaire, Texas 77401 • Telephone (713) 668-8400

E. E. Lilley, Production Manager - Offshore District
Southern Exploration and Production Division

October 2, 1981

Mr. Raymond R. Emerson
P. O. Box 1159
Anchorage, Alaska 99510

Re: Norton Sound Draft
Equipment Impact Statement
(DEIS)

Dear Mr. Emerson:

Getty Oil Company has reviewed the Norton Sound DEIS and concurs with the comments submitted by the Alaska Oil and Gas Association.

Although the conclusions of the DEIS support the proposed OCS lease sale, the tone is negative. There is an imbalance of emphasizing potential harmful impacts while minimizing potential beneficial impacts.

This is especially evident in discussions of potential impacts due to oil spills and socio-economic factors. Oil spill occurrence is described in a somewhat confusing and misleading mixture of conditional probabilities and an arbitrary relative risk scale. Socio-economic concerns are discussed with strong language but are unsupported. The DEIS admits that many of the potential impacts are unlikely and are based on "worst case" scenarios, it is these same "worst case" scenarios that lead to suggested mitigating measures such as seasonal drilling restrictions and tract deletions. We believe that mitigating measures should be based on "realistic" or "most likely" scenarios not on "worst case" conditions.

We hope that these comments will be helpful in preparing the Final Environmental Impact Statement and will be considered when preparing EIS's for other OCS and onshore areas.

Sincerely,

E. E. Lilley

EEL/APP/pam

Maniilaq Association

Senior Citizen Center
P.O. Box 260
Kotzebue, Alaska 99752
(907) 442 - 3590

P.O. Box 256
Kotzebue, Alaska 99752
(907) 442 - 3311
Alcoholism Program (907) 442 - 3914

Public Health Nursing
P.O. Box 170
Kotzebue, Alaska 99752
(907) 442 - 3313

October 15, 1981

Esther C. Wunnicke, Manager
Alaska OCS Office
P.O. Box 1159
Anchorage, Alaska 99510

RE: Comments on Oil & Gas Lease Sale Number 57 Norton Basin

Dear Mrs Wunnicke:

These comments are written on behalf of the Board of Maniilaq Association, a non-profit organization representing the eleven communities of the NANA Region.

The board is concerned that the impact upon seasonal marine mammal migrations due to oil & gas exploration and production will have an adverse affect upon the subsistence life style enjoyed by many of the residents of the region.

Maniilaq contends that the exploration and development of the Norton Basin could radically change the migration habits of the whales, walrus, seals, and waterfowl that must migrate through the proposed sale area.

Before a sale can be made information is needed on pack ice movement, and the hazards of pollutants when pack or shore ice is present. Information regarding the effects of surface and sub-surface noise on mammal migration in regards to traditional feeding areas must also be taken into consideration.

Thank you for the opportunity to comment.

Sincerely,

MANIILAQ ASSOCIATION

Fred Womark,
Executive Vice - President

FW/cja

MEMBER VILLAGES
Ivisaappa..t, Nunatchiaq, Ipnatchiaq, Katyaak, Kivaliniq, Laugviik, Qikiqtagnik, Nautaaq, Nuurvik, Akuligaq, Isinnaq
Ambler, Buckland, Deering, Kiana, Kivalina, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak

LISKOW & LEWIS
ATTORNEYS AT LAW
A PARTNERSHIP OF LAW CORPORATIONS

NEW ORLEANS, LA. 70139
ONE SHELL SQUARE
FIFTIETH FLOOR
TELEPHONE (504) 581-7979
TWX 810-981-5283

LAFAYETTE, LA 70505
321 TRAVIS ST
P O BOX 52008 O C R
TELEPHONE (318) 232 7424

CULLEN R LISKOW (1893-1971)
AUSTIN W LEWIS (1910-1974)

WILLIAM M MEYERS
ROBERT T JORDEN
CHARLES C GREMILLION
GENE W LAFITTE
BILLY N HINES
JAMES L PELLETIER
THOMAS O HARDEMAN
L LINTON MONGAN
JOHN M RING
STEPHEN T VICTORY
EDWARD J GAY III
KENNETH E GORDON, JR
WILLIAM R PITTS
LEON J REYNOLD, JR
J BERRY ST. JOHN, JR
DONALD R ABAUNZA
JOHN M WILSON
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LAWRENCE P SIMON, JR
FREDERICK W BRADLEY
HENRY M MARRARI
B GENE PENDLEY

THOMAS F GETTEN
GEORGE N ROBINSON, JR
GEORGE J DOMAR
MARILYN C MALONEY
ROBERT W BOOKER, JR
JOSEPH C GIGLIO, JR
LARRY M ROZDEL
LAW CORPORATIONS

BRUCE J GRECK
PATRICK W GRAY
DEBORAH BANN PRICE
ROBERT E HOLDEN
JOE B NORMAN
THOMAS M MCNAMARA
JAMES M MANSFIELD III
BILLY J DOMINGUE
LAMBERT M LAPEROUSE
RURAN A LARITER
PHILIP K JONES, JR
ANNE E TATE
WILLIAM W FUGN
PAUL B DAVID
LYNN C HANTEL
JULIE E SCHWARTZ

New Orleans, 70139
October 8, 1981

Ms. Esther C. Wunnicke, Manager
Alaska OCS Office
Bureau of Land Management
Post Office Box 1159
Anchorage, Alaska 99510

Re: OCS Lease Sale No. 57
Norton Sound

Dear Ms. Wunnicke:

Pursuant to the notice relative to the subject hearings appearing in the Federal Register of September 16, 1981, enclosed is the written presentation of the Alaska Oil and Gas Association. This presentation is included in one binder containing the respective written statements of William M. Meyers, Dr. T. D. Ralston, L. A. Darsow, Lee V. Gefvert and Charles H. Baskin.

It is respectfully requested that the copies of the above listed statements be filed in the hearing record and be made a part thereof.

Yours very truly,

LISKOW & LEWIS

By

WMM:mb
Enclosure

DEPARTMENT OF THE INTERIOR HEARING

ON PROPOSED OCS OIL AND GAS

LEASE SALE NO. 57

NORTON SOUND

WRITTEN PRESENTATION
OF THE
ALASKA OIL & GAS ASSOCIATION

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STATEMENT OF CHARLES H. BASKIN

DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT

HEARING ON PROPOSED OIL AND GAS
LEASE SALE NO. 57

NORTON SOUND

OCTOBER 8, 1981
ANCHORAGE, ALASKA

STATEMENT OF WILLIAM M. MEYERS

I AM WILLIAM M. MEYERS OF THE LAW FIRM OF LISKOW & LEWIS OF NEW ORLEANS, LOUISIANA. I AM APPEARING HERE TODAY AS ATTORNEY FOR THE ALASKA OIL AND GAS ASSOCIATION ("AOGA"). MANY OF AOGA'S MEMBERS ARE DIRECTLY INTERESTED IN THE EXPLORATION FOR OIL AND GAS IN THE ALASKAN OCS.

AOGA HAS REQUESTED AND OBTAINED PERMISSION TO MAKE A FOUR WITNESS PRESENTATION. THIS AOGA APPEARANCE WILL, NO DOUBT, EXPEDITE THE HEARING PROCESS BECAUSE MOST OF ITS MEMBERS WILL FOREGO INDIVIDUAL PRESENTATIONS AT THESE HEARINGS.

BEFORE PROCEEDING WITH THE FIRST AOGA WITNESS, A FEW BRIEF COMMENTS MIGHT BE IN ORDER.

AT THE OUTSET, IT APPEARS APPROPRIATE TO REFLECT ON THE PURPOSE OF THE PROPOSED LEASE SALE. AS STATED IN THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ("DEIS"), THE PROPOSED SALE IS PART OF THE OVERALL UNITED STATES EFFORT TO REDUCE DEPENDENCY ON FOREIGN SOURCES OF PETROLEUM. THE DEIS RECOGNIZES THAT A COMMERCIAL DISCOVERY IN NORTON SOUND WOULD HELP TO ENSURE UNINTERRUPTED ENERGY SUPPLIES AND REDUCE THE BALANCE OF PAYMENTS DEFICIT RESULTING FROM PETROLEUM IMPORTS. (DEIS, SEC. 1, P. I).

WHILE THE BALANCE OF PAYMENTS DEFICIT HAS A CRIPPLI EFFECT ON THE AMERICAN ECONOMY, A GREATER DANGER LIES IN THE FACT THAT OUR NATIONAL SECURITY AND ECONOMIC WELL-BEING ARE LARGELY DEPENDENT UPON AN UNSTABLE AND UNCERTAIN SUPPLY OF FOREIGN CRUDE. IT IS CHILLING TO CONSIDER THE EFFECTS OF AN EXTENDED INTERRUPTION OF OUR PETROLEUM SUPPLY FROM THE MIDDLE EAST. CERTAINLY, IT WOULD PRODUCE SEVERE ECONOMIC DISRUPTION IN THIS COUNTRY, WITH ATTENDANT SOCIAL UPHEAVALS.

IT IS IMPORTANT FOR ALL OF OUR CITIZENS TO REALIZE THAT NO MIRACLES ARE EXPECTED WHICH WILL SOMEHOW QUICKLY SOLVE OUR ENERGY PROBLEMS. WHILE OTHER ENERGY FORMS, SUCH AS SOLAR, GEOTHERMAL, ETC., MUST BE DEVELOPED AND UTILIZED, THE DEIS NOTES THAT THESE OTHER ENERGY SOURCES WILL NOT SIGNIFICANTLY REDUCE DEPENDENCE ON FOREIGN ENERGY SUPPLIES BEFORE THE END OF THE CENTURY. (DEIS, SEC. 1, P. 1).

THE DEIS RECOGNIZES ALSO THAT OUR ABILITY TO REDUCE THE IMPORTATION OF FOREIGN OIL DEPENDS HEAVILY ON ALASKAN PRODUCTION. THE GENERAL ACCOUNTING OFFICE ESTIMATES THAT FOR THE PERIOD 1985-2000, ALASKA WILL SUPPLY 16-19% OF ALL U.S. CRUDE PRODUCTION AND THAT BY THE YEAR 2000, ALASKA WILL SUPPLY OVER 18% OF ALL U.S. NATURAL GAS PRODUCTION (DEIS, SEC. 1, P. 1). IF THESE PREDICTIONS ARE TO BE REALIZED, THEN IT IS IMPERATIVE THAT THE PROPOSED LEASE SALE AND OTHER ALASKAN OCS LEASE SALES BE HELD ON SCHEDULE.

SOME MAY SAY THAT A REASON FOR NOT HOLDING THE SALE IS THE FACT THAT EXPLORATION EFFORTS IN THE SO-CALLED OCS FRONTIER AREAS, SUCH AS THE LOWER COOK INLET AND THE GULF OF ALASKA, HAVE NOT, TO DATE, MET WITH SIGNIFICANT SUCCESS. HOWEVER, IT SHOULD BE REMEMBERED THAT EXPLORATION IS A CONTINUING EFFORT. EARLY FAILURES HAVE ON OCCASION RESULTED IN THE APPLICATION OF NEW IDEAS LEADING TO SUBSTANTIAL DISCOVERIES WHEN PROSPECTS FOR SUCCESS WERE DIM. A PRIME EXAMPLE, OF COURSE, IS THE PRUDHOE BAY FIELD WHERE ONE MORE WELL LED TO THE DEVELOPMENT OF A FIELD WHICH IS NOW OUR MOST PROLIFIC PRODUCER. IN ANY EVENT, IN ORDER FOR OUR NATION TO PROPERLY PLAN FOR THE FUTURE, THE DOMESTIC ENERGY SOURCES AVAILABLE TO US MUST BE DETERMINED WITHOUT UNREASONABLE DELAY. ALL AREAS HAVING POTENTIAL FOR PETROLEUM PRODUCTION MUST BE PROMPTLY AND ADEQUATELY ASSESSED.

THE INOUSTRY IS CONFIDENT THAT IT CAN CONDUCT THAT ASSESSMENT IN NORTON SOUNO SAFELY ANO WITHOUT SIGNIFICANT AOVERSE ENVIRONMENTAL EFFECTS. WHILE IT RESPECTS THE HARSH PHYSICAL CONOITIONS IN THE SOUND, IT HAS THE OEMONSTRATEO ABILITY TO OPERATE SAFELY IN THAT AREA.

FOR THOSE WHO MAY HAVE ENVIRONMENTAL CONCERNS RELATIVE TO THE PROPOSEO SALE, I WOULD CALL ATTENTION TO THE FACT THAT SINCE THE FIRST FEOERAL OFFSHORE LEASE SALE IN ALASKA WAS HELO IN 1976, THERE HAVE BEEN SIGNIFICANT CHANGES IN THE STATUTORY ANO REGULATORY SCHEME. DRASTIC REVISIONS HAVE BEEN MADE IN THE OUTER CONTINENTAL SHELF LANOS ACT ANO THE REGULATIONS GOVERNING OCS OPERATIONS. THESE REVISIONS INCLUOE VIRTUALLY ALL OF THE PROTECTIVE MEASURES OEEMEO NECESSARY BY THOSE WHO HAVE OPPOSEO OFFSHORE PETROLEUM OPERATIONS ON THE PAST.

A COMMENT MAOE IN LATE 1979 BY THE THEN UNOER SECRETARY OF THE OEPARTMENT OF INTERIOR, JAMES A. JOSEPH, IS EVEN MORE PERTINENT TOOAY. SECRETARY JOSEPH SAIO THAT:

> "EVEN WITH THE BEST TECHNOLOGY, THE BEST TRAINING ANO THE STRONGEST PRECAUTIONARY MEASURES, THE ENVIRONMENTAL RISKS OF ENERGY OEVELOPMENT OF ANY TYPE CANNOT BE REOUCEO TO ZERO. HOWEVER, THE COSTS ANO RISKS OF NOT PURSUING AN AGGRESSIVE

> ENERGY OEVELOPMENT PROGRAM, BOTH ON THE OCS ANO ONSHORE, ARE CLEARLY GOING TO BE INCREASINGLY UNACCEPTABLE - ECONOMICALLY, POLITICALLY, ENVIRONMENTALLY ANO SOCIALLY."
> (STATEMENT PREPAREO FOR OELIVERY BY SECRETARY JOSEPH AT A MEETING OF THE OCS AOVISORY BOARD IN NORFOLK, VIRGINIA, ON OECEMBER 6, 1979.)

OUR FIRST AOGA WITNESS IS OR. T. O. RALSTON.

OUR NEXT AOGA WITNESS IS MR. L. A. OARSOW

THIS IS A CONTINUATION OF THE PRESENTATION OF AOGA:

OUR FIRST WITNESS IS MR. LEE V. GEFVERT.

OUR LAST WITNESS IS MR. CHARLES BASKIN.

STATEMENT OF

TERRANCE D. RALSTON
EXXON PRODUCTION RESEARCH COMPANY

PREPARED FOR THE
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
HEARING

ON

NORTON SOUND
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL & GAS LEASE SALE 57

ANCHORAGE, ALASKA
OCTOBER 8, 1981

My name is Terrance D. Ralston. I am a Research Associate with Exxon Production Research Company in Houston, Texas. I have a Bachelors and Masters degree in Engineering Mechanics from the Pennsylvania State University and a PhD in Mathematics from Carnegie-Mellon University. I have participated in arctic research activities since I joined Exxon in 1973. I have also served on a National Research Council, Marine Board panel that assessed research needs in sea ice mechanics and I am presently a member of the International Association for Hydraulic Research's working group on sea ice forces.

I will discuss industry technological capabilities that apply to the Norton Sound lease area. I will briefly mention exploration drilling and focus on production activities that would follow if commercial reserves of oil or gas are discovered. I will refer to present operations in Cook Inlet, the Beaufort Sea, and northern Europe to show that the technology that will be required for production either already exists or is largely being developed for operations elsewhere. I will also mention some of the design considerations and precautionary measures that are used to assure safety in arctic operations.

Exploration Drilling

The initial exploration of the sale area will most likely use conventional jack-up rigs operating during the summer ice-free period or gravel islands operating continuously in the shallow portions of the lease area. Other systems such as ice strengthened drill ships and semi-submersibles could also be used to extend drilling into the ice covered season.

Slide 2 Although drilling from a jack-up rig is a routine operation in other offshore areas, a number of site-specific studies are conducted to ensure the success and safety of the operation. The following studies were conducted as part of the 1980 Norton Sound stratigraphic test well, which was drilled by a jack-up rig during the ice-free season:

- Ice forecasts, were conducted to estimate the duration and timing of the open water period based on historical satellite data and other records. Real-time observations and forecasts were also conducted near the beginning and end of the open water season.

- A site specific seismic survey was used to detect any potential shallow drilling hazards.

- A soils investigation was conducted to ensure that the local soil conditions would provide an adequate foundation for the rig.

- A tow efficiency study was used to plan the mobilization and demobilization of the rig.

- Extreme and normal meteorological and oceanographic conditions were determined to help select the proper rig for the environment.

- Logistics studies were conducted to develop schedules for the appropriate supply of material and the transportation of personnel.

that the island has been surrounded by a large pile of grounded ice rubble that was created by extensive ice movement during the freezeup period. Production islands in Norton Sound would be somewhat larger than the Beaufort Sea exploration islands. They would have greater freeboard because the waves and tides in Norton Sound are larger than in the Beaufort. They would also have larger surface area to accommodate production equipment.

Slide 7 Caisson-retained islands could also be used in Norton Sound. A caisson-retained island is a gravel island in which the fill material is retained by a concrete or steel barrier around the island circumference. The barrier protects the island from wave erosion and significantly reduces the amount of fill material needed to construct the island. Dome Petroleum is presently constructing a caisson retained island for exploration in about 75 ft of water in the Canadian Beaufort Sea.

Slide 8 A concrete island is a third type of gravity structure that could be used in Norton Sound. As shown on this slide, the production facilities are supported on a large concrete base. The size of the base would be determined by the local site conditions. The major advantage of this type of structure is that all of the production equipment can be installed at the construction site rather than in the field. The fully equipped island would then be towed to the production site and would be ready to operate after installation. This minimizes the amount of offshore construction time.

Transportation Systems

Slide 9 The method chosen to transport oil and gas out of the Norton Sound will depend on many factors. However, the technology exists to use either land pipelines or ice

breaking tankers. Land-based pipelines would be constructed with the same technology that was developed for the Alyeska pipeline.

Subsea pipelines would be used offshore to transport oil and gas from production platforms to either an onshore or offshore loading terminal. The pipeline routes would be selected to avoid natural hazards based on seafloor surveys during the development stage. They would be buried to a sufficient depth to avoid damage by current and ice scour. The lines would be subject to periodic inspection similar to offshore pipelines in more temperate climates.

Slide 10 Icebreaking tankers are presently used by Finland in the Gulf of Bothnia. This slide lists 18 such tankers that were delivered for service in the late 1970's. They are used to supply the coastal cities in northern Finland with products from refineries in the south. These icebreaking tankers are about 1/5 the size of those assumed in the draft EIS for service in Norton Sound. They are designed for operation in 1 meter-thick level ice and 10 meter-thick ridges. These ships are equipped with an ice breaking hull, a double bottom, double shell, and other features designed to reduce ice resistance. The design of Norton Sound tankers would build on this existing technology to produce larger, more powerful vessels for reliable year-round transportation.

Table III. A.1.1 of the draft EIS shows all of the technology for production operations either exists now or will be available within 5 years, with the exception of ice action on or near an offshore terminal. Since Dome Petroleum is presently designing an offshore terminal for operation in the Beaufort Sea and there is an AOGA project addressing offshore terminals in Norton Sound, this exception may not be justified. Actually there is no ice force problem, per se, with offshore

This list of studies also serves as an example for the type of activities associated with exploration drilling.

Production Platforms

Slide 3 If a commercial discovery were made in the proposed lease area, several types of pile founded or gravity platforms could be used for production operations. These may include cylindrical and conical pile-founded structures and several types of artificial islands which act as gravity structures.

Slide 4 The Cook Inlet Monopod is an example of a pile-founded steel structure. This is one of fourteen production platforms that were installed in Cook Inlet in the mid 1960's. The platform stands in 62 ft of water, and was designed for a 30 ft tidal range. This platform was designed for 32 wells which reach an area of the oil reservoir 2 miles in diameter. A Norton Sound version of this type of platform would be similar, but somewhat heavier and stronger, because of the increased ice forces encountered.

Slide 5 Conical-shaped structures can be used to reduce ice loads by causing bending, rather than crushing failure of the ice to occur. This slide shows a structure that is similar to the Cook Inlet Monopod, but is equipped with a conical collar. The magnitude of the horizontal component of the ice force is directly related to the inclination angle of the conical collar.

Gravel island construction for exploration drilling in the Beaufort Sea has developed over the past decade with the completion of more than 20 islands in water depths

Slide 6 reaching out to 63 ft. This slide shows one of these islands in mid winter. Note

EXPLORATION DRILLING

MOST LIKELY SYSTEMS
- JACK-UP RIGS OPERATING IN ICE-FREE WATER
- GRAVEL ISLANDS OPERATING CONTINUOUSLY IN SHALLOW WATER

OTHER POSSIBILITIES
- ICE STRENGTHENED DRILLSHIPS AND SEMI-SUBMERSIBLES COULD BE USED TO EXTEND DRILLING INTO THE ICE COVERED SEASON.

Slide 1

PRODUCTION PLATFORMS

- PILE-FOUNDED STEEL STRUCTURES
  - CYLINDRICAL
  - CONICAL
- GRAVITY STRUCTURES
  - GRAVEL ISLANDS
  - CAISSON-RETAINED ISLANDS
  - CONCRETE ISLANDS

Slide 3

NORTON SOUND STRATIGRAPHIC TEST WELL SITE-SPECIFIC STUDIES

- SEA ICE FORECASTS
- SEISMIC SURVEY
- SOILS INVESTIGATION
- TOW EFFICIENCY
- METEOROLOGY AND OCEANOGRAPHY
- LOGISTICS

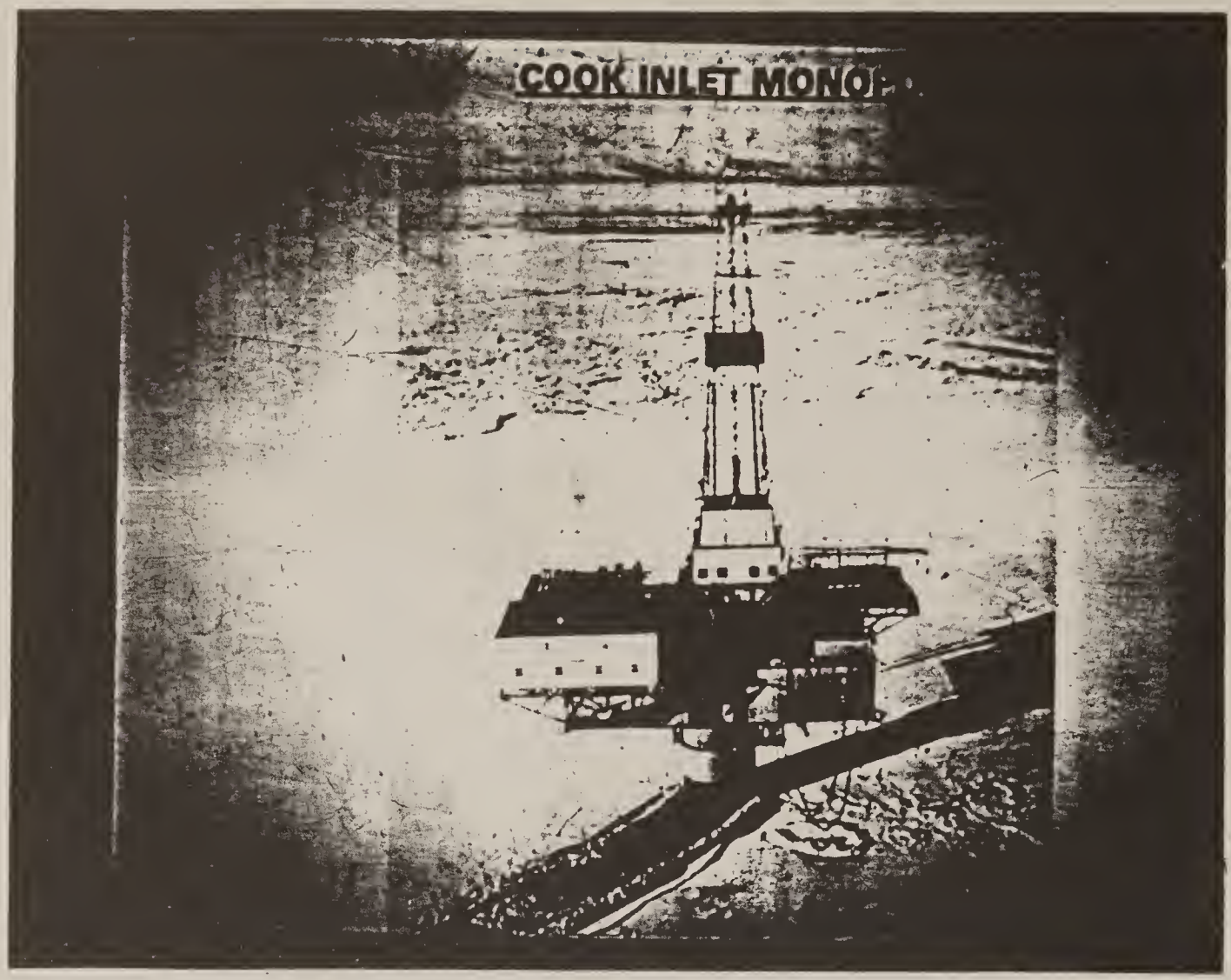
Slide 2

terminals. They can be constructed with the same strength and structural integrity as any other offshore structure. The ice problem concerns the formation of ice rubble at the terminal which could interfere with tanker operations. Ice rubble formation at a particular terminal site will depend on the terminal geometry and the water depth and local ice movement characteristics. This ice management problem will affect the scheduling and economics of terminal operations, but it is not a safety or structural problem requiring new technology.

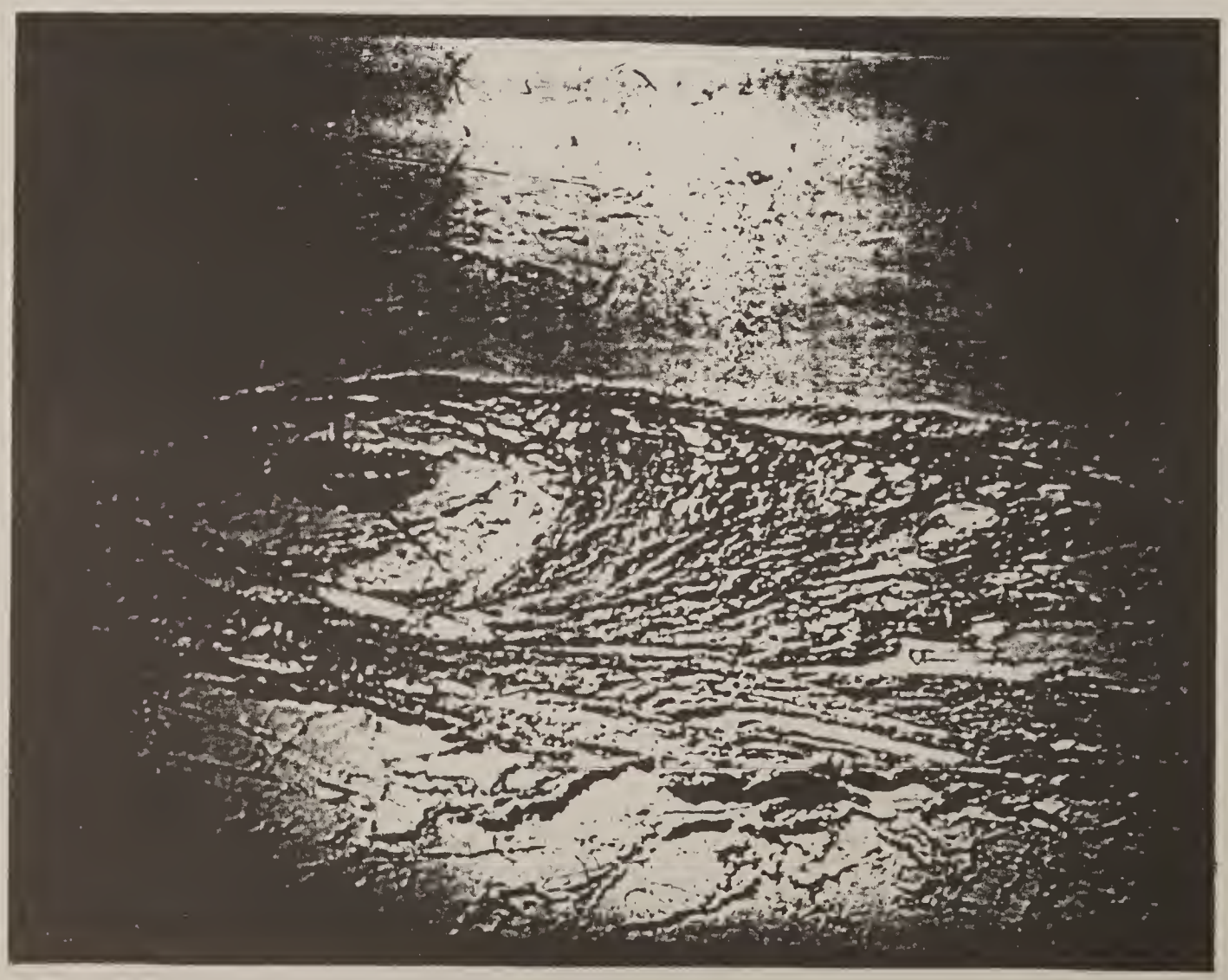
Conclusion

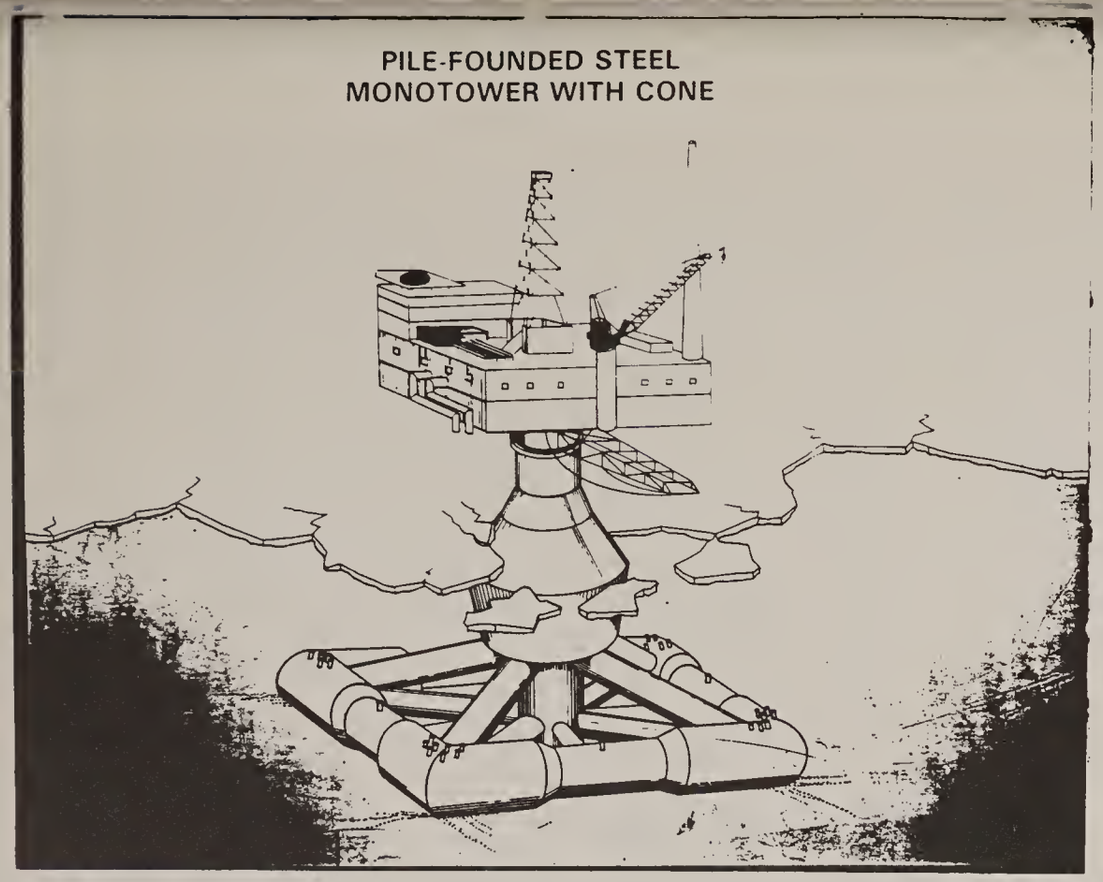
In summary, the technology required for exploration and production activities in the Norton Sound lease area is not a critical consideration for leasing. Much of the applicable technology has been previously developed and proven in actual field operations in Cook Inlet, the Beaufort Sea, and northern Europe. Several feasible alternatives exist for most activities. These alternatives will be further refined and evaluated for site-specific applications after the sale takes place and the tracts are awarded.

Slide 5



Slide 6





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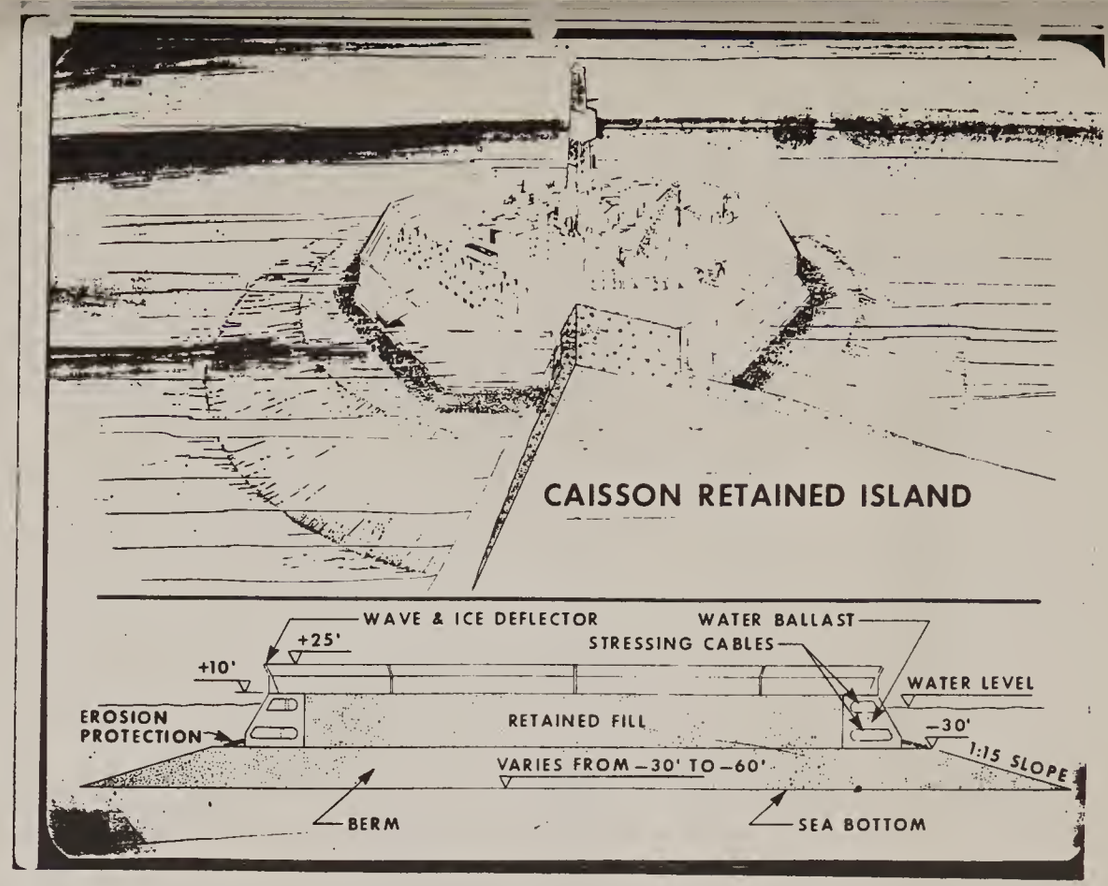
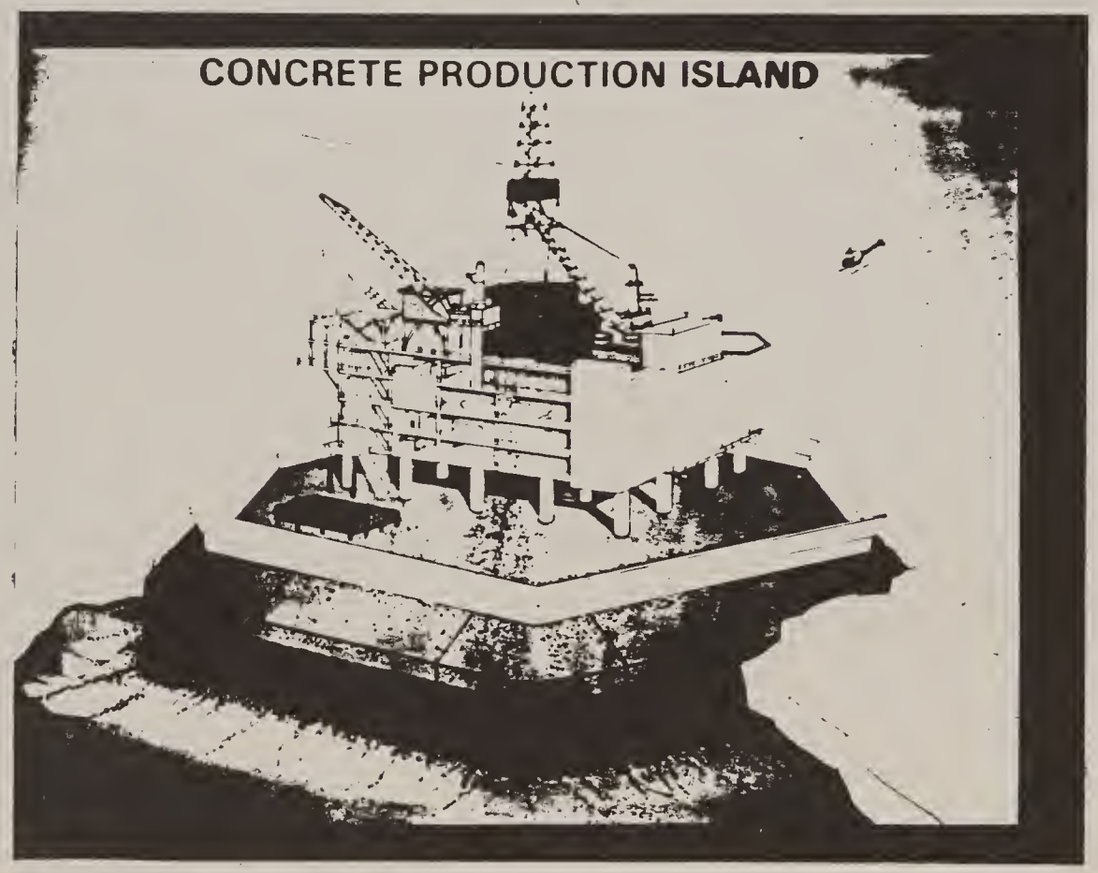


Slide 7

L-63

Slide 8



TRANSPORTATION SYSTEMS

- LAND PIPELINES
- ICEBREAKING TANKERS

Slide 9

ICEBREAKING TANKERS
GULF OF BOTHNIA

NUMBER	TYPE	SIZE	DATES
4	LUNNI	16,000 DWT	1976-77
14	IGRIM	14,500 DWT	1975-78

ICE CONDITIONS: 1M LEVEL ICE; 10M RIDGES

SHIP FEATURES: ICE BREAKING HULL
DOUBLE BOTTOM
DOUBLE SHELL

Slide 10

STATEMENT OF

LEONARD A. DARSOW
REPRESENTING THE ALASKA OIL AND GAS ASSOCIATION

PREPARED FOR THE
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
HEARING

ON

NORTON SOUND
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL & GAS LEASE SALE NO. 57

ANCHORAGE, ALASKA
OCTOBER 8, 1981

OPENING REMARKS

My name is Leonard A. Darsow. I am Anchorage District Superintendent for Amoco Production Company and responsible for Amoco's operations in Alaska. Following my graduation from Montana School of Mines in 1958 with a Bachelor of Science Degree in Petroleum Engineering, I have worked in a variety of engineering and supervisory positions during my 24 years with Amoco. My experience includes oil and gas producing operations, drilling operations, workover operations, reservoir engineering and management. During the late 1960's, I worked as a reservoir engineer on Amoco's Upper Cook Inlet Fields and became very familiar with the vast amount of research and technology utilized in successfully developing and producing those offshore fields. Approximately five years ago I moved to Anchorage to supervise and manage Amoco's operations within the State, which includes the operation of four offshore platforms in the Upper Cook Inlet.

INTRODUCTION

My testimony today is intended to stress, once again, the oil and gas industry's capability to successfully operate on the offshore tracts which are scheduled for offering in the proposed OCS Lease Sale No. 57, Norton Sound, Alaska. I will also direct some information toward the possible and

probable socio-economic-cultural changes which may effect the local Alaskan natives. To achieve my intent, I will make some brief but significant comparisons between the proposed sale area and other areas of exploration or development within the State.

COMPARISON OF NORTON SOUND AND OTHER OFFSHORE AREAS

A primary consideration when planning a program for a new geographical area is to determine if a similar project has been accomplished. Fortunately, we have had many similar exploratory operations in the State which have proven to be operationally successful, and in some cases, economically successful; i.e., the discovery of hydrocarbons in sufficient quantities to lead to development and production. Even though the DEIS for Sale No. 57, Norton Sound, does reference the accomplishments of the oil and gas industry, I believe it is important to strengthen those views by reiterating some of the more significant events.

How hostile is the natural environment of Norton Sound as compared to Upper Cook Inlet, Lower Cook Inlet, the Northern Gulf of Alaska, or the Beaufort Sea? Our industry has successfully performed offshore exploratory drilling in all areas mentioned and, as you are aware, we have also successfully operated development and production facilities in the Upper Cook Inlet. We believe the physical conditions,

which have been met successfully, readily demonstrate our ability to operate under adverse circumstances. Ice and tidal conditions of the Upper Cook Inlet are severe. Wind and wave conditions of the Lower Cook Inlet and the Northern Gulf of Alaska can be extreme. Temperature and weather conditions in the Beaufort Sea are a challenge. Yet our industry has proven we can successfully and safely operate in all of these environments. Certainly we can operate successfully in the Norton Sound.

SIGNIFICANT EVENTS

Upper Cook Inlet

1. Exploratory drilling began in the summer of 1962.
2. The first permanent drilling and production platform was installed in 1964.
3. Oil and gas production commenced in 1965.
4. Fourteen platforms installed between 1964 and 1968 are all producing oil and/or gas today.
5. Offshore cumulative production through July 31, 1981 has been 750,550,322 barrels of oil and 941,466,523 MCF of gas. If I convert the gas production to an oil equivalent on the basis of heating value, I can say that the total cumulative production of oil and gas combined is approximately equal to 935,000,000 barrels of oil.

6. During the accomplishment of these events, no significant negative impact has occurred.

The design and installation of the permanent drilling-production platforms and the submarine pipelines in Upper Cook Inlet was a tremendous engineering accomplishment. This expertise has been enhanced over the years and can be applied in the Norton Sound with appropriate modifications. We must realize the timing for activities in the Norton Sound will not be as rapid as in the Upper Cook Inlet. In fact, the DEIS appears to be slightly optimistic with its projected timetable. With a late 1982 lease sale, exploratory drilling will probably not begin prior to 1984. If early hydrocarbon discoveries are made, first production could possibly occur by 1990. This expanded time frame as compared to the Upper Cook Inlet is primarily due to the changes in permitting regulations and the attendant delays.

Northern Gulf of Alaska, Lower Cook Inlet

Eleven exploratory wells in the Northern Gulf of Alaska and ten exploratory wells in the Lower Cook Inlet have been drilled successfully without any adverse impact to the environment or the lifestyles of the nearby towns and/or villages. Significant concern was expressed prior to actual operations; however, the industry did an admirable job in

minimizing any possible negative impact to the local people. Unfortunately, no discoveries have been made in either area to date.

Beaufort Sea

Offshore exploratory drilling operations from natural islands, man-made gravel islands, and man-made ice islands have been successfully accomplished. Commercial discoveries of hydrocarbons have been reported, and future development plans are being designed.

Socio-Economic-Cultural Changes

Certainly anytime there is a change of operations within a given area, there is an accompanying feeling of concern. How will I be effected by the operation? With good planning and communication between the industry, the Federal government, the State government, the local government and inhabitants, any, if not all, of the negative concerns can be minimized. Past operations out of Yakutat and Homer serve as a positive illustration. Likewise, current television advertising by the North Slope Borough exemplifies the positive results of having money available from successful oil development within their area. The money is providing capital for beneficial construction projects and associated employment.

If oil or gas discoveries are made in the Norton Sound, sufficient lead time is available for proper planning and implementation to minimize any legitimate concerns. With successful oil and gas development, an improved standard of living should become a reality.

SUMMARY

In conclusion, the oil and gas industry has proven its capability to safely explore, develop, and produce offshore tracts under physical conditions more severe than the conditions to be encountered in the proposed Norton Sound sale area. Our industry has the technical knowledge, equipment, and expertise to proceed with operations within the OCS Sale No. 57 area right now. Possible negative impacts and socio-economic-cultural changes can be greatly minimized through good planning, communication, and a cooperative attitude on the part of all concerned. We intend to plan well, to communicate, and to cooperate with all Federal, State, and local authorities. We do not believe that our presence in the Norton Sound will prove to be a negative experience for the citizens of that area or that there will be any significant detrimental effect on the environment.

STATEMENT OF

LELAND V. GEFVERT
ARCO EXPLORATION COMPANY

PREPARED FOR THE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
HEARING

ON

NORTON SOUND
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL & GAS LEASE SALE #57

ANCHORAGE, ALASKA
OCTOBER 8, 1981

Madam Chairman and Panel Members:

My name is Lee Gefvert. I am representing the Alaska Oil and Gas Association, and I appreciate this opportunity to discuss possible, but not very probable oil spills, in the Norton Sound Area. During the ten years that I have lived in Alaska, I have worked full-time on offshore petroleum operations and engineering. I have been employed by Atlantic Richfield Company for 32 years, and have worked continuously in the oil industry since 1946.

I want to speak first about oil spill scenarios and trajectories.

The draft environmental impact statement for the Norton Sound contains several oil spill scenarios prepared by the Alaska Oil and Gas Association. These scenarios were prepared to illustrate responses to several postulated oil spills posed by the Outer Continental Shelf Group of the Bureau of Land Management. These scenarios are found in Section VI of Appendix K of the impact statement. I was Chairman of a task group of four that developed the scenarios. These scenarios show that the postulated oil spills can be cleaned-up using equipment already developed and proven, and which is available upon manufacture. This equipment can be deployed to the scene of an oil spill and placed in operation within 72 hours of the oil spill. This equipment is "state-of-the-art", and is capable of skimming substantial volumes of oil in 8' seas and 20 knot winds without endangering personnel. While the clean-up of oil spilled on and under moving ice requires innovative use of existing equipment, it does not require the development of unproven devices for retrieving spilled oil.

These industrial clean-up capabilities contradict the assumptions made in the draft environmental impact statement regarding spilled oil drift trajectories. The draft environmental statement assumes industry could not deploy equipment at the site of an oil spill and commence clean-up operations until the oil drifted for ten days. We disagree. We believe the clean-up would commence in no more than three days.

The statement further assumes that the spill would not be capable of harming a beach after 30 days of drifting, and that clean-up operations would not commence until ten days after the spill. Therefore, during this 30 days of drifting, there would have been only 20 days of oil skimming. Since, in our view, skimming would begin within three days, and not ten as the DEIS assumes, it follows that any spill would be incapable of significant harm after 23 days rather than the 30 days assumed in the statement.

Using a 23-day travel period rather than a 30-day travel period as suggested in the environmental impact statement would be more realistic. Twenty-three days of travel would not transport the oil as far as the 30-day period, thereby minimizing the possibility of impacting sensitive areas.

I want to speak next about an industry oil spill clean-up organization for Norton Sound.

In order to obtain a permit from the U.S. Geological Survey to drill an exploratory well, an oil company is required to have detailed oil spill contingency plans in place. In the Beaufort Sea, for example, the U. S. Coast Guard requires that equipment having a skimming capability of 30 gallons per minute in 8' seas and 20 knot winds be available for response to a spill site within 6 hours from the time of the spill. In order to guard against the remote possibility of a very large spill, industry is required to have a back-up capacity to mount a maximum effort within 48 hours. In the Beaufort Sea, this 48-hour response requirement has been met through industry's formation of a clean-up organization which stockpiles and maintains equipment and trains personnel in its use. Another safeguard lies in the fact that the U. S. Coast Guard On-Scene Coordinator is empowered to determine whether or not the response to a spill is inadequate. If he concludes it to be inadequate, he is authorized to take charge of the clean-up operation and may utilize government personnel and equipment. The costs of the government participation in the clean-up is borne by the company responsible for the spill.

Atlantic Richfield, under my guidance, has been working to form an oil spill clean-up organization for the Norton Sound area since January 1981. A substantial number of companies are interested and are helping to charter such an organization. It is expected that a suitable charter will be ready for execution by the member comapnies by the end of this year.

This clean-up organization will be unusual because it will, at the outset, encompass all of the future Bering Sea sale areas and not just the proposed Norton Sound area. It will also include the future Chukchi Sea and Beaufort Sea sale areas, as well as the existing Beaufort Sea oil spill clean-up organization's area of interest. The new organization will have in its framework the potential to include the Gulf of Alaska and the Cook Inlet clean-up organizations so that industry ultimately can have one organization for all of the offshore waters of Alaska. This will make it possible to deploy large amounts of equipment and trained personnel to the site of an oil spill anywhere in Alaskan waters. We believe this to be feasible since oil spill statistics for American waters reveal that the possibility of having two significant oil spills simultaneously occurring in Alaskan waters is extremely remote. Since much of the "state-of-the-art" oil spill clean-up equipment is air transportable, a rapid response to distant spills is possible.

I want to thank the panel for this opportunity to address it on these matters of concern, and I am available to answer your questions.

STATEMENT OF

CHARLES H. BASKIN
MARATHON OIL COMPANY

PREPARED FOR THE
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
HEARING

ON

NORTON SOUND
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OCS PROPOSED OIL & GAS LEASE SALE 57

ANCHORAGE, ALASKA
OCTOBER 8, 1981

STATEMENT OF CHARLES H. BASKIN
FOR PRESENTATION AT THE
NORTON SOUND DEIS HEARING
ANCHORAGE, ALASKA
OCTOBER 8, 1981

My name is Charles H. Baskin and I am Environmental Coordinator for Marathon Oil Company in Alaska. I have a Bachelor of Science Degree in Zoology and a Master of Science Degree in Civil Engineering from Texas A&M University. I am also chairman of the Alaska Oil and Gas Association's Environmental Committee, which I am representing today.

I would like to address my comments to the environmental impacts of the proposed sale, as identified in the DEIS, and the proposed stipulations relating to these impacts.

The organization and accuracy of the DEIS is noticeably improved over similar documents we have received in the past, yet there is a negative attitude reflected in much of the text regarding possible impacts. In addition, although some of the conclusions seem to be reasonable, a number of the conclusions fail to adequately support the need for some of the proposed mitigating measures.

The primary example of the lack of adequate supporting evidence occurs in the discussion and justification of seasonal drilling restrictions. The main reason for establishing such restrictions is purported to be to protect marine mammals from oilspills. However, in the conclusions of Section IV.B.2.d. "Impacts on Marine Mammals" (page 174) the DEIS states:

> Coastal hauling areas located around the perimeter of Norton Sound occupied seasonally by spotted seals and walrus, and areas of shore fast ice which constitute breeding habitat of ringed seals are at low levels of risk of oilspill contact as may be associated with the proposal (Alternative I). (emphasis added)

It further states:

> Marine mammal coastal habitats under greatest risk of contact are those of eastern St. Lawrence Island and the Punuk Islands. Localized direct and indirect effects of oilspills on marine mammals at those locations may occur, but generally are unlikely, given the assumed rate of oilspills which may be associated with this proposed sale. (emphasis added)

The same conclusion was reached in Section IV.B.2.e. "Impacts on Endangered Species" (page 185) where it is stated:

> It is unlikely that sale-related activites associated with exploration phases would significantly impact endangered whales. (emphasis added)

The single conclusion upon which the seasonal restriction is based maintains that a relatively high probability of oilspills moving into offshore areas immediately west of the proposed sale area, suggests that if spills occurred during periods of peak spring and fall migration, substantial adverse effects on major population segments of marine mammals are possible. The number of qualifying statements contained in this conclusion indicates that it is largely based upon conjecture. Worst case scenarios of this type may be useful in assessing potential consequences, but should not be used to support such a drastic mitigating measure as seasonal restrictions. In addition, this conclusion incorrectly assumes that exposure to oil will automatically result in adverse impacts. The growing body of information indicates that marine mammal exposure to oil is not as detrimental as once believed. For example, during the Santa Barbara oil spill in 1969, many people were fearful that the gray whales would suffer injury or death becauae of exposure to the oil. Although the whales passed directly through the area affected by the spill, scientists were able to find no evidence to indicate that the whales had experienced any adverse impacts.

The Alaska Oil and Gas Association therefore recommends that the seasonal drilling restriction to protect marine mammals during peak migration periods should be deleted from the Final EIS because there is insufficient evidence to justify such a measure.

Another proposed mitigating measure that is not adequately supported by the text or conclusions in the DEIS is the prohibition of storage and loading of produced oil in the southern portion of the sale area. In fact, the rationale given in the DEIS for the proposed stipulation is that it is in response to concerns voiced at the Norton Sound Synthesis Meeting. Those concerns were that 1) an oilspill could have a significant impact upon the coastal habitat of the Yukon Delta and 2) there is no proven technology that could deal with an oil spill that reached the delta.

First, the Synthesis Meeting was held before the release of the USGS oil spill trajectory model which demonstrates only a 2% probability that if an oil spill occurred, it would contact the delta. This is the case even if the spill originates in the southeast corner of the sale area. This information would undoubtedly have allayed the concerns of many at the Synthesis Meeting. The justification in the DEIS for the stipulation, however, is misleading in that it cites a 20% chance of the Delta zone being contacted. The "zone" is a 10 kilometer buffer area extending out from the delta.

Second, the claim that there is no proven technology to deal with an oil spill that reaches the Delta is unfounded. Section VI of Appendix K of the DEIS entitled "Norton Sound Oil Spill Scenarios" describes a response to an oil spill reaching the Yukon Delta shoreline. This scenario presents a detailed description of the various cleanup methods and technology which could be employed in the Delta. Therefore, it is difficult to claim in one part of the DEIS that oil spill clean-up technology does not exist, when in another part of the DEIS it discusses presently available technology for cleaning up a spill which reaches the Delta. (Additionally, the concern expressed by the Synthesis Meeting participants that damage to the Delta would be caused by transportation of heavy oil spill equipment also is demonstrated to be unfounded. As the scenario explains,oil spill cleanup equipment could be transported by helicopter and air cushion vehicle rather than surface vehicles.)

We submit that the concerns expressed at the Norton Sound Synthesis Meeting are unfounded. As these concerns formed the basis for the proposed stipulation prohibiting offshore oil and gas storage and loading, we recommend that the stipulation be dropped from further consideration.

With regard to the proposed stipulation requiring pipeline transportation of hydrocarbons, the DEIS lacks any substantial justification for the requirement. Although the stated intent of the measure is to protect pipelines from damage by various factors, the stipulation goes beyond that intent by requiring pipelines to be used over other transportation methods. In development of new sale areas, the maximum amount of operational flexibility should be maintained. This flexibility should not be artificially limited by a stipulation which requires one transportation method over another. It is recommended that the proposed stipulation be deleted from the Final EIS and be replaced with a measure specifying that the lessor and lessee mutually determine the most appropriate transportation method on a site-by-site basis.

The DEIS addresses, at length, the impacts of noise on wildlife. An important point is made in Section IV.B.2.d "Impacts on Marine Mammals" that although some evidence exists to suggest that adverse effects on non-endangered marine mammals may result from underwater manmade noise, there are many instances of animal behaviors or physiology not being affected detrimentally. It is also concluded in this section that voluntary compliance with the Information to Lessees regarding bird and mammal protection would be sufficient to minimize and eliminate most sale-related disturbance due to vessels or aircraft sources in the immediate vicinity of the proposed sale. AOGA agrees with this conclusion; however, we think that the text of the Final EIS should make a distinction between response to noise and disturbance by noise. A response is simply an induced reaction which may or may not be harmful. A disturbance implies a change which is harmful to varying degrees.

In summary, AOGA recommends that the proposed mitigating measures regarding seasonal drilling restrictions and the prohibition of offshore storage and loading be deleted from the Final EIS as they have not been demonstrated to be necessary. It is further recommended that the proposed stipulation regarding pipeline transport from offshore areas be changed to allow a greater amount of flexibility for both the lessor and lessee.

Natural Resources Defense Council, Inc.

122 EAST 42ND STREET
NEW YORK, N.Y. 10168

212 949-0049

Washington Office
1725 I STREET, N.W.
SUITE 600
WASHINGTON, D.C. 20006
202 223-8210

Western Office
25 KEARNY STREET
SAN FRANCISCO, CALIF. 94108
415 421-6561

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Laurance Rockefeller
Joan C. Schwartz
John Sheehan
David Sive
Gus Speth
Thomas B. Stoel
Thomas A. Troyer
Beatrice Abbott Duggan
U.N. Representative
John H. Adams
Executive Director

COMMENTS
OF THE
NATURAL RESOURCES DEFENSE COUNCIL, INC.

ON THE

NORTON SOUND
JUNE 1981 DRAFT
ENVIRONMENTAL IMPACT STATEMENT

FOR

PROPOSED OIL AND GAS
LEASE SALE 57
ALASKA OUTER CONTINENTAL SHELF

Prepared By:

Liza Carter
Frances Beinecke
Sarah Chasis

October 16, 1981

New England Office: 17 ERIE DRIVE • NATICK, MA. 01760 • 617 655-2656
Public Lands Institute: 1657 PENNSYLVANIA STREET • DENVER, CO. 80203 • 303 831-7101

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The Natural Resources Defense Council, (NRDC), an environmental public interest organization with over 45,000 members nationwide, submits the following comments on the Draft Environmental Impact Statement (DEIS) for OCS lease sale 57, Norton Sound.

We find the DEIS on lease sale 57 deficient for the following reasons:

(1) the environmental and socioeconomic impacts which may result from sale 57 are inadequately assessed;

(2) alternatives are insufficiently explored;

(3) reasonable mitigation measures are ignored.

1. The Environmental and Socioeconomic Impacts Which May Result From Sale 57 Are Inadequately Assessed.

The DEIS does not adequately consider the environmental and socioeconomic issues which are of concern in the Norton Sound Region. It minimizes the importance of many environmental effects by failing to explore the ramifications to the biological resources and local peoples, and fails to mention other impacts. The following ommissions and deficiencies should be corrected in the FEIS.

(a) The oil spill scenarios in Appendix K of the DEIS do not include the impacts of a blowout occuring just before ice-over which continues to flow throughout the winter season. As this is one of the hazards of drilling in Arctic waters, the consequences of such an event should be appraised. Such a discussion should address the capability of

existing oil spill containment technology to deal with this kind of occurence.

(b) The problem of transportation of oil-contaminated bottom sediments to the Yukon delta system needs to be addressed. With every storm off the Yukon delta, bottom sediments are stirred up and moved ashore. If these sediments were to contain hydrocarbons, degradation of the resource could result.

(c) There is no consideration of the danger that ice might transport oil to the bowhead overwintering area. Northerly winds move ice (which could contain spilled oil) from the north coast of Norton Sound, to the area south of St. Laurence Island where the bowheads congregate.

(d) The DEIS does not explore the extreme importance of the sediment plume flowing out of the Yukon River Delta. This provides essential nutrients to the marine food chain in the Northern Bering and Chunckchi Seas. The short and long term ramifications of an oil spill in this area to all forms of wildlife, including the endangered gray whale, the bowhead whale, and the peregrine falcon need to be evaluated.

(e) The cumulative effects on the Norton Sound Region of sale 57, 38, 70, 75, 83, 85, and 86 are not discussed and the impacts of the Lost River Mining Project,

the Port of Nome Deepwater Terminal, and the oil and gas leasing of Calista Corporation offshore lands are inadequately detailed. Some of the seperate environmental impacts are mentioned for the Deepwater port and the Mining Project. But, the cumulative impacts of these projects and lease sale 57 are not discussed. Specifically, the DEIS fails to analyse the socioeconomic impacts on the region resulting from an expanding workforce required by each of these projects and the greater oil spill risk due to increased tanker traffic from the Port of Nome deepwater terminal. These cumulative impacts should be assessed before the sale, not later when it is too late to avert negative impacts. Furthermore, it is possible to make valid predictions about the cumulative effects of lease sales judging from USGS estimates of hydrocarbon resources for the planning area.

(f) The issue of the respective worth of renewable as opposed to nonrenewable resources in Norton Sound has not been addressed. The annual benefits from the renewable resources of Norton Sound accruing to the hundreds of people living in the area who depend on these resources for subsistance are not adequately considered or detailed.

(g) An evaluation of the enclave approach to minimizing socioeconomic disruption must be included.

(h) An analysis of the synergistic effects of chemical wastes and hydrocarbons on biological resources has not been done.

(i) The hazards of offshore, subsea permafrost are not mentioned.

(j) Consideration of the synergistic effects of unstable bottom sediments and storm surges or ice on drilling operations has not occured.

(k) The DEIS does not provide any justification for its assumption that technology will be available for all stages of drilling activity in Norton Sound, nor that clean up equipment and methods will be available.

2. Alternatives are insufficiently explored.

Alternatives developed in the DEIS are not satisfactory. The benefits of Alternative 3 (delay of sale) are inadequately detailed. Consideration of an alternative which would offer smaller lease sales over a period of time is absent as is an alternative which specifically excludes areas of sensitive and critical habitat.

The analysis of Alternative 3 (delay of sale) concludes that it would delay the potential impacts of the proposal

but would not avoid them. We believe that the alternative was inadequately analyzed. Many of the negative impacts of the lease sale can be diminished by allowing sufficient time to develop appropriate technology and mitigating measures, provide lead time for planning efforts, and collect additional needed environmental data. This conclusion is based on the following facts.

Many of the mitigating measures suggested in the DEIS are beyond the authority of the DOI to require, but do fall within the jurisdiction of a CMP or the regional government. However, the regional government is not expected to be in place until 1984-85 and the CMP which is being developed will not be finished until 1984. Since the purpose of a CMP is to insure rational planning for the coastal zone, the federal government is precluding meaningful local participation in the development and implementation of necessary mitigating measures by offering the lease sale now. It is also diminishing the value and authority of any local planning effort. The sale should be delayed until a time when a regional government is established and a CMP is adopted. The DEIS does not adequately enumerate the advantages of allowing the local government to be established.

Furthermore, the DEIS does not detail the advantages of delaying the sale until oil spill containment and clean up equipment can be developed. Technology does not now exist for many aspect of OCS activity in the Bering Sea. Clean up

or containment equipment for use in oil spills in ice is not available. A recent NAS study, Safety and Offshore Oil, concluded that:

> "Current technology to recover spilled oil is severely limited above sea state 3, in rapidly moving icebearing waters, and at night. The ability to clean up spills would be negligible during major periods of the year in frontier areas such as the Northern Atlantic and Alaska." (P. 32)

Proven technology is designed to be used in ice-free conditions and is most effective in calm waters. Norton Sound is covered in ice for half the year and is subject to frequent and severe storms. Clean up and containment procedures designed for use in the Beaufort Sea region during the ice season are not workable in Norton Sound. Because the Beaufort Sea is covered in stable, landfast ice, it can support bulldozers and heavy equipment. Ice in the Norton Sound, however, is predominantly moving pack ice with patches of open water. The ice conditions in Norton Sound increases the probability that oil would be incorporated into the ice pack and/or will be dispersed throughout the ice by repeated freezing and thawing. Moreover, the rapid southerly movement of the ice could transport the oil hundreds of miles to the south before clean up and containment procedures could be attempted. A study entitled Recommendations for Minimizing the Impacts of Hydrocarbon Development on the Fish, Wildlife, and Aquatic Plant Resources of the Northern Bering Sea and Norton Sound, prepared by the Habitat Division of the

Alaska Department of Fish and Game (1981), has concluded that no acceptable techniques for cleanup have been developed for the ice conditions of Norton Sound. The sale should be delayed until the technology to contain and recover spilled oil is available. If satisfactory technology is not developed, seasonal restrictions prohibiting drilling from November 1 to June 1 should be implemented. The DEIS does not discuss the benefits of proceeding in either of these ways.

The DEIS has identified major gaps in the environmental data base. Because the DEIS does not identify what studies are being done, it is impossible to determine whether there is an adequate data collection process which will be used to develop mitigating measures in a timely manner. A major benefit of a delay would be the opportunity to remedy these deficiencies. To insure the design of satisfactory mitigation measures, studies are needed to ascertain the following:

-- The distribution of all marine mammals and birds, and the timing and location of migration routes.

-- The location of significant bird and marine mammal concentrations in Norton Sound and all affected areas.

-- The location of all fish and shellfish spawning grounds as well as their spawning seasons.

-- The location of unstable bottom sediments.

-- The effects of noise, both above and below the surface of the water on the behavior of marine mammals.

-- The potential for ballen fouling in whales and its impact.

-- The danger of bioaccumulation of hydrocarbons or other toxic chemicals associated with drilling in all wildlife species.

-- To determine which tracks should be deleted because of a wealth of biological resources to be found on them.

-- To determine seasonal restrictions on specific tracts to:

(1) protect fish and mammal young during critical stages, and
(2) protect migration routes.

The infrastructure to meet the current needs of Nome's population (2,892) is inadequate. There is a severe housing shortage, the water system and sewerage collection system reaches only half the community, and the road system is minimal or nonexistent. Nome's population is anticipated to rise to over 6,000 as a result of this sale. There can be no doubt that a delay during which time the city of Nome could plan for the expected population increase, and build critical infrastructure can only be beneficial.

In sum, the absence of a local planning authority, the lack of clean up technology, the necessity of further biological studies, and the grossly inadequate infrastructure in the city of Nome all argue for a delay of the sale to allow time to avert predicted negative impacts from OCS activities. The DEIS fails to adequately detail the advantages that would result from Alternative 3.

No consideration is given to the alternative of offering smaller areas for sale over an extended period of time to

avoid the potential boom/bust cycle of energy development. The advantages of this alternative are detailed below.

-- Work would be available for a longer period of time providing greater continuity within the community, and incentive to train the local people for OCS jobs.

-- A chance to test new methods in this frontier area is provided. Techniques and approaches learned from past mistakes can be implemented on subsequent drilling sites rather than committing the entire lease sale area to becoming a guinea pig for unproven technology.

-- There would be a reduced strain on the inadequate infrastructure of Nome. New infrastructure would be used for a longer period of time than under Alternative 1 justifying the investment in new construction.

-- The housing shortage and the inflation pressures would not be as severe.

-- Socioeconomic disruption would be less.

-- The negative impacts from OCS activities on the subsistance resources would not be as great.

-- The negative impacts from OCS activities on the subsistance resource would not be as great.

-- There would be a diminished risk of an oilspill at any one time.

3. Reasonable mitigation measures have been ignored.

The DEIS fails to analyze reasonable mitigation measures which address the following problems. The resource base of the Eskimo society, which revolves around subsistance hunting and fishing activity, is threatened; inflation in food, housing and fuel prices is expected to skyrocket without a commensurate rise in wages causing extreme economic hardships for wage earners and impossible conditions for subsistance hunters; a fiscal crisis will develop in Nome when it is faced with the need for a greatly expanded infrastructure without a taxable base on which to raise the revenue to build it; and increased racial tension and discrimination resulting in stress related diseases, drunkeness, divorce and other indicators of social disorders will develop. The ommission of mitigating measures of the above socioeconomic impacts is a serious deficiency.

The DEIS proposes certain stipulations to mitigate the impacts of lease sale 57. These are: Protection of Cultural Resources, Orientation Programs, Transportation of Hydrocarbon Products, Seasonal Protection of Marine Mammals for Effects of Oilspills during Peak Migrational Periods, Areas of Special Concern and Information to Lessees. We support these stipulations, but believe they are not sufficient. Additional

mitigation measures, not proposed or analyzed in the DEIS are required if environmental impacts are to be minimized. They should be included in the FEIS.

Deletions

(1) All tracts which pose a threat to the Yukon Delta should be deleted. The DEIS states on page 17 that "the Yukon River Delta is a very important coastal habitat, and there is no proven technology to deal with a spill incident that could reach the sensitive delta and associated wetlands. (Transportation of heavy equipment from external locations could be more damaging than no cleanup effort at all)." The Yukon River Delta is an important bird habitat and a nutrient source for much of the marine life in the Bering Sea. The effects of oil in Arctic wetlands are persistent and devastating. We submit that this risk should not be taken and the threatened tracts should be deleted.

(2) All zones of major bird and animal concentrations should be deleted.

(3) Tracts which threaten Safely Lagoon and Golovin Bay should be deleted. These are both high risk areas with valuable biological resources.

Stipulations

(1) A seasonal restriction should be imposed for OCS operations over the entire lease area from November 1 to June 1 until such time as acceptable technology to clean up and contain hydrocarbons from spills released both above and below the ice is available.

(2) Seasonal restrictions should be established for specific sites which the environmental studies show to be critical habitat for subsistance resources, birds and marine mammals.

(3) All formation waters should be reinjected.

(4) Drilling muds should not be disposed of on any tracts covered by 10 meters or less of water. This measure would serve to minimize the onshore transport of mud in some areas, and to prevent the stagnant accumulation of wastes in others.

(5) The industry must have the on-site capability of containing blowouts towards the end of the icefree season so that iceover does not prevent the successful containment of a well.

(6) Clean up equipment and trained personnel should be on site before drilling commences.

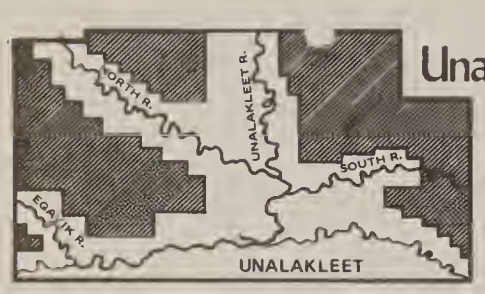
(7) Noncritical areas should be determined during exploration and development for the location of facilities.

(8) Compensatory measures should be developed for the local people in the event subsistance resources are significantly damaged thereby depriving them of their primary source of livelihood.

Conclusion

There are many ommisions and deficiencies in the DEIS which must be corrected. Alternative 3 (delay of sale) needs to be given greater consideration in the FEIS. Additional mitigation measures need to be explored.

We support Alternative 3 with the provisions that our suggested mitigation measures are adopted when the sale proceeds.



Unalakleet Native Corporation

P.O. BOX 100
Unalakleet
Alaska 99684
(907)624-3411
OR
624-3020

COMMENTS ON THE ORAFT ENVIRONMENTAL IMPACT STATEMENT

PREPARED FOR
OCS PROPOSED OIL & GAS LEASE SALE NO. 57
(NORTON SOUNO)

Submitted by the

UNALAKLEET NATIVE CORPORATION

Helga Eakon
General Manager
Unalakleet Native Corporation
Post Office Box 100
Unalakleet, AK 99684

October 10, 1981

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INTROOUCTION

Located on Norton Sound at the mouth of the Unalakleet River, Unalakleet is the second largest town in a region encompassing the entire Seward Peninsula. The population has increased only seven-fold since the earliest recorded 188D figure of 10D. Not since the Klondike-era of mineral extraction has Unalakleet been scrutinized by outsiders with interests in exploration and exploitation of the Sound's oil and gas resources.

Since both commercial and subsistence fishing, as well as subsistence hunting and gathering, comprise major components of Unalakleet's economy, the Unalakleet Native Corporation has a salient interest in the protection of human, marine and coastal environments. Evidence of concerned residents' interests in such protection was brought out in the October 5th public hearing at Unalakleet, where eighteen (18) participants voiced opposition to accelerated OCS activity in the Norton Sound during the 3-hour hearing.

At the July hearings held in Anchorage, the Unalakleet Native Corporation went on record as protesting the gross inadequacy of the Draft Supplement to the Final Environmental Impact Statement on the Proposed 5-year OCS Oil and Gas Lease Sale Schedule.

In this position paper, we wish to document our recommendation that Alternative III (delay the sale) be adopted. We would prefer that Alternative II (no sale) be adopted, but history seems to indicate that this demand will go unattended. In requesting responsible agency officials and others to intelligently balance resource development against the protection of the Norton Sound human, marine and coastal environment, we present the following comments to buttress our recommendation that the lease sale be postponed (if it is to be held at all).

We shall tie into the discussion of our thesis that Alternative III be adopted,

the pertinent statutes that apply to OCS oil and gas lease sales.

A. ARGUMENTS TO SUPPORT DELAY OF THE SALE

I.

Lack of a Coastal Zone Management (CZM) Plan in the Norton Basin Region

a.
In General

The 1980 Final EIS (FEIS) on the 5-Year schedule stressed the importance of a Coastal Zone Management (CZM) Plan to assure residents control over OCS-related land use, recommending that the region affected be given an opportunity to prepare one before siting of enclaves and similar facilities takes place (FEIS, p. 73). The Draft Supplement to the FEIS (hereinafter, Draft) simply (and incorrectly) stated that "a draft CZM Plan has been developed." (Draft, p. 54). In fact, NO DRAFT IS EXPECTED TO BE PREPARED UNTIL THE FALL OF 1983, and perhaps will not be finalized until mid-1984 (Personal communication with Sylvia Spearow, Office of Community and Regional Affairs, Anchorage, August 6, 1981). Some of the more significant deficiencies of the Draft Environmental Impact Statement prepared for Proposed Sale No. 57 (hereinafter, DEIS #57) appear in references to the following statutes, infra.

b.
Coastal Zone Management Act (CZMA) of 1972 (16 USC 1451-1464), and the Outer Continental Shelf Lands Act, 43 U.S.C. 1301 et. seq.

These statutes articulate a strong federal commitment to local land-use control. Section 1304(c)(2) of OCS Lands Act prohibits the Secretary from granting a license or permit for an activity described in the plan and affecting land or water use in the coastal zone of a State with a CZM Plan unless the state concurs or " is conclusively presumed to concur" with the consistency certification accompanying such plan as described in 16 U.S.C. 1456. Paragraphs (c)(1) and (3)(B)

of 16 USC 1456 mandate the federal agency conducting or supporting activities directly affecting the Coastal Zone to conduct or support those activities in a manner which, to the maximum extent practicable, is consistent with the applicable CZM Plan. Moreover, the applicant must assure the federal agency that the plan "complies" with the state CZM Plan. and will be carried out in a manner consistent with such program.

This consistency requirement cannot be given meaning in the absence of such a plan. That the OEIS #57 glosses over the development of a CZM Plan merits a full and fair inquiry in support of our argument that input from local interests would potentially tip the balance in favor of Alternative #3 until the Bering Straits region has adopted its CZM Plan.

(In its brief summary of probable impacts of the delay of sale alternative, OEIS #57 acknowledges that such delay would "provide additional time for planning and preparation for community impacts associated with the proposed lease sale." (p. 25).)

c.

National Environmental Policy Act, 42 USC 4321 et. seq.

Congress in enacting this statute recognized that the Nation, as public trustee, must "create and maintain conditions under which man and nature can exist in productive harmony" with the goals of preserving and maintaining "wherever possible, and environment which supports diversity, variety of individual choice" and achieving "a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities" and enhancing "the quality of renewable resources and approach/ing/ the maximum attainable recycling of depletable resources." Section 4332 on Impact Statements states that prior to approval of exploration, development and production plans, the Secretary must determine whether such approval constitutes a "major action significantly affecting the human environment," as defined under NEPA, and thus whether such approval must be accompanied by an Environmental Impact Statement (EIS). The heart of NEPA is Section 4332 (C)(iv) & (v), which require a detailed statement from the federal agencies on "the relationship between local short-term uses of man's environment and the maintenance and the enhancement of long-term productivity," and "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

We ask you to look at pages 246-248 of the OEIS #57; a total of 1 3/4 pages are devoted to "Relationship Between Local Short-Term Uses and Maintenance and Enhancement of Long-Term Productivity." Not detailed and certainly contra to Section 1502.14 Alternatives which requires agencies to:

> (a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
>
> (b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

OEIS #57 concludes: "Alternatives to the proposal, such as cancellation, delay, and partial deletion options reduce to varying degrees both the long- and short-term environmental effects, as well as the long- and short-term energy supply benefits, as explained in the preceding impact sections." (p.248 re NEPA Section 4332(C)(iv) requirement).

The one-and-one/half-page treatment in DEIS #57 on "Irreversible and Irretrievable Commitment of Resources" is a fitting introduction to our second reason for supporting Alternative III. Before we go on, it is worth noting that the OCS Lands Act requires that, at least once in a frontier area, approval of a development and production plan be considered a major Federal action. Since the Norton Basin has never been subjected to petroleum industry leasing, we ask for time to develop a CZM Plan that will take into account a

serious consideration of short-term uses versus long-term productivity of resources FROM OUR POINT OF VIEW. Governmental assessments, historically, have not squared precisely with a local people's evaluation of their needs, as shown in the following discussion.

II.

The Irreversible and Irretrievable Commitment of Resources in the Norton Sound Region coupled with the Unavoidable Impacts should Sale #57 be Adopted are important considerations in favor of Delay or Alternative #3

The primary issue here is our concern about careful assessment and preservation of the resilience of social and biological systems in the Norton Sound Region in the wake of the externally-induced disturbances surely inherent in the proposed sale. The key question is, can the social and biological systems adapt fast enough to rapid, cataclysimic disturbances?

A reading of OEIS #57 gives support to our opinion that delaying the sale would not only give the government time to do adequately prepared studies, but the petroleum industry time to come out with technological innovations to mitigate the threats of environmental hazards, to wit:

a.

In General

The prevalent theme inherent in the Inuit communities in the NOrton Sound region is : Our society and well-being are closely attuned to the health of our natural surroundings. As stated in the OEIS, "Primary subsistence resources are not only essential to the daily life and diet of resident villagers, but they provide the economic security normally associated with money in a cash economy." p. 131. It has been estimated that 80-to-90% of the diet in our region is locally acquired. Technical Report #54, p. 292. It is reported

that 71% of Native families in the region derive at least one-half of their food from subsistence activities.

If the sale went through, it "would add a number of stresses to a predominately subsistence-based economy and social system in this region, some of which are unavoidable. OCS development would permanently alter the wilderness characteristics of the region, which itself helps to support a subsistence-dependent lifestyle." OEIS, p. 138. One of the applicable laws designed to protect some of the sealife essential to our subsistence activities is codified in 16 USC 1531 et seq.

b.

Endangered Species Act of 1973

This act defines "endangered species" as any species which is in danger of extinction throughout all or a significant portion of its range, whereas a "threatened species" is any species which is likely to become endangered within the foreseeable future. Within the Norton Basin, according to DEIS #57, there are five endangered cetaceans and one endangered avian species which may occur to varying extent in or near the proposed sale are: the bowhead whale; the gray whale; the humpback, fin and Sei whales; and the peregrine falcon. p. 74. Of these, the bowhead whale and the gray whale constitute a significant element in the subsistence diet. Although Unalakleet does not traditionally harvest the bowhead whale, for example, some of the residents do make use of this sea mammal by importation from our northern Inuit friends. One important fact overlooked in all the technical papers and indeed absent in testimonies regarding the proposed oil and gas lease sales IS THE EXTENT TO WHICH IMPORTATION OF ONE SUBSISTENCE LAND OR SEA LIFE TO OTHER REGIONS PLAYS IN THE VARIOUS SUBSISTENCE OIETS IN THE OIFFERENT ALASKA NATIVE CULTURES.

Indeed, the OEIS #57 throughout is exceedingly cautious in stating the unavoidable adverse effects of the proposed sale:

> The extent of unavoidable adverse effects associated with this alternative /proposed sale/ are unknown, but would be limited to localized, short term,impacts due to oilspills or localized but presently unidentified potential effects of disturbance. (at p. 177).

One example repeatedly used throughout the DEIS is the Santa Barbara Channel spill, e.g. "In 1969, the entire northward migration of gray whales passed through or near the area contaminated by the Santa BArbara Channel spill, yet the number of gray whale strandings was not significantly different from previous years. . . ." (p. 178). Yet, as was brought out in the Unalakleet public hearing in October, to cite examples from oceans other than the Bering Sea, is immaterial because of the unique meteorological and geophysical conditions in the Norton Basi . Ice conditions differ greatly from those of either Prudhoe Bay or the Cook Inlet. The prolonged presence of drifting ice and susceptibility to severe storm conditions WILL REQUIRE THE OEVELOPMENT BY THE PETROLEUM INOUSTRY OF TECHNOLOGY THAT HAS NOT, AS YET, BEEN TESTEO -- LET ALONE PROVEN.

-c-

Marine Protection, Research and Sanctuaries Act

Delay of Proposed Sale #57 would also give the petroleum industry to do research on activities associated with underwater drilling and production of oil and gas in the unique ecosystem found in the Norton Basin. An applicable statute pertaining to marine protection is 33 USC 1411, Ocean Oumping. This was designed to make sure that such dumping "will not unreasonable degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems or economic potentialities.

Here is how the OEIS #57 deals with the subject of petroleum compliance with the applicable laws:

> If the physical constriants can be coped with in the manner that Table III.A.L.-1 implies and appropriate Federal, state, and local regulations for the first sale area in Norton Sound, then there are no other physical constraints which could create any cumulative

> constraints for subsequent oil and gas sales and offshore activities in Norton Sound. p. 116.

This necessarily (and not reasonably) assumes that the petroleum industry would have sufficient time to in fact develop the requisite technology to IN FACT COMPLY WITH THE APPROPRIATE FEOERAL ENVIRONMENTAL REGULATIONS, AS WELL AS FEOERAL, STATE, ANO LOCAL PERMITS ANO LEASES.

The OEIS lists six constraints on OCS oil and gas activities FOR WHICH THE PETROLEUM INDUSTRY HAS NOT AS YET OEVELOPEO THE REQUISITE TECHNOLOGICAL SAFEGUAROS: (1) ice forces; (2) faults; (3) thermogenic gas; (4) current scour; (5) biogenic gas; and (6) liquefaction. p. 115. The development of technology that would address these suspected hazards is still in the early stages . pp. 115-116.

The only logical conclusion to draw is that the proposed sale would reduce the time necessary for preparatory studies and technological innovations that could mitigate the threat posed by these environmental hazards, THEREBY SIGNIFICANTLY INCREASING THE PROBABILITY OF SERIOUS OIL SPILL OCCURRENCES.

B. RECOMMENOATION

It is the recommendation of the Unalakleet Native Corporation that the proposed sale be delayed:

1. to give us sufficient time (until 1986) to develop a Coastal Zone Management Plan in coordination with the other villages in the Norton Sound region; and

2. to give the federal government sufficient time to do preparatory studies and the petroleum industry time to develop technology to not only mitigate environmental hazards but to do so in compliance with the applicable Federal, state, and local laws and regulations

Respectfully submitted,

UNALAKLEET NATIVE CORPORATION

BY: Helga Eakon, General Manager

SEAL

SOHIO ALASKA PETROLEUM COMPANY

3111 "C" STREET
ANCHORAGE, ALASKA

TELEPHONE (907) 276-5111

MAIL POUCH 6-612
ANCHORAGE, ALASKA 99502

October 16, 1981

Esther Wunnicke,
Office Manager
Alaska Outer Continental Shelf Office
P. O. Box 1159
Anchorage, AK 99510

Dear Ms. Wunnicke,

Sohio appreciates the opportunity to review the Draft Environmental Impact Statement for proposed OCS oil and gas lease sale #57, Norton Sound. Attached are our comments on this document.

Our hope is that you will find these comments constructive and useful in the preparation of the Final Environmental Impact Statement. On the whole we have been impressed with the quality and thoroughness of this document. If you have further questions regarding our response to the DEIS, please do not hesitate to call me (907-263-5473).

Yours truly,

Bruce I. Clardy,
Sohio Exploration Supervisor

BIC/ep

Attachment

CCMMENTS ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT, PROPOSED OCS OIL AND GAS LEASE SALE #57
NORTON SOUND, ALASKA

Sohio Alaska Petroleum Company is pleased to have the opportunity to comment on this draft version of the Environmental Impact Statement for the proposed Oil and Gas Lease Sale #57 in the Norton Sound. We have analyzed the impact statement through several disciplines, and following our general comments we have supplied more detailed comments which we hope you will find usefull in preparing the FEIS.

First, we would like to submit that we feel this Norton Sound Draft Environmental Impact Statement represents a vast improvement over the previous Environmental Impact Statements on oil and gas lease sales in Alaska. The sections on baseline biology, socioeconomic, sociocultural, and economics, present an accurate synopsis of the available data. The description sections for biological resources were especially well written and objective. The following sections in particular were concise, and informative:

Section III C.3, Birds
Section III C.4, Marine Mammals
Section III C.5, Terrestrial Mammals
Section III C.6, Endangered Species

Section IV B.2.d, Impacts on Marine Mammals, and section IV B.2.e, impacts on endangered species, could well serve as model sections for writing an EIS. They were well referenced, well organized, objective and for the most part resulted in conclusions that were appropriately qualified and adequately supported within the text.

There are, however, several serious flaws in the analytical and impact sections of the report that tend to exaggerate possible adverse impacts of the lease sale. The problems we feel most serious stem from Section II, Table 2.B.1.a.-1 upon which presumably most of the impact projections are based. The exploration and development scenario portrayed in this table presents a very unrealistic development pattern. The scenario is overly optimistic in terms of scheduling exploration and development activity. The time indicated from initial exploration to field construction activities, and first production is highly unrealistic. For example, first production is indicated to occur only 6 years after the lease sale, the first of nine platforms are to be installed in the third year after the lease sale, and all platforms are installed by the sixth year. This is obviously a compressed schedule and should not be followed in assessing any development or exploration impacts on the Norton Sound area. The reasoning behind this type of schedule suggests merely a rationalization for five year leases in OCS areas such as the Norton Sound. We would conclude that longer primary term leases are definitely necessary to safely and adequately discover and bring to production new reserves in a frontier area such as this and other Bering Sea lease sale areas.

Another concern we have is that the risk and effects of oil spills are seriously overstated in the DEIS. When oil spill risk analyses are applied to impact projections the discussion of their spplication is weak; and in many instances their application is improper because important variables have not been considered. It should be understood that the oil spill risk analysis is based on statistics acquired elsewhere in the OCS and does not take into account industry's excellent record in Cook Inlet and improvements in technology in recent years as well as improvements that will more than likely occur in the future. In particular, the DEIS does not reflect the excellent safety record of U.S. tankers. The report looks at world wide tanker history whereas the U.S. experience would more accurstely depict the Alaska tanker safety record. Also, the spill trajectory models are flawed in that they do not consider weather; evaporation, or natural dispersion in the water column which can be expected to greatly reduce the amount of toxicity of hydrocarbons reaching the shoreline. Additionally, the models no not account for any oil spill countermeasures which would obviously be implemented. In evaluating oil spill risks associated with the various sale alternatives it is important that the text differentiate between the overall probability of spills and the severity of related impacts. Otherwise, the use of oil spill risk statistics can be misleading.

During the discussion in the DEIS on the impacts an oil spill to the Yukon River Delta would have, additional unsubstantiated assumptions are made. DEIS authors have hypothesized a "disasterous" impact based on the unsupported results of three natural processes: tidal excursions, local wind-induced flow and storm surges. It is stated within the brief, two paragraph descriptions of these processes that hard, scientific information for the area in question is not available. Tidal effects in the distributary channels are unknown, actual nearshore current measurements have not been obtained, and there is no evidence to correlate the effects of sea breezes in the currents near the Yukon River Delta. This is scant information upon which to base assumptions of far reaching, long term, extremely serious, adverse impacts.

There is also a possibility that these natural processes may be significant in enhancing the physical/chemical breakdown of spilled oil. Storm surges may have a positive component along these lines and therefore, could potentially minimize the predicted 5 to 10 year persistence of spilled oil.

We are not arguing against the inclusion of a worst case scenario, however, we feel that it is a serious fault of the document that it does not include a thorough discussion on the physical/chemical degradation of spilled oil in conjunction with the scenario. Incorporation of these considerations would result in a more realistic appraisal of effects.

The above is not an isolated example of a misleading discussion on impacts in the DEIS. Throughout the Biological Impacts Sections, there are elaborate discussions of "disasterous" impacts; and yet the bottom line, the understated conclusion, is that there really is no problem because of the low probabilities of various "pre-requisites for disaster" actually occuring.

We would like to re-empahsize our concern with proposed and unwarrented seasonal restricitons on exploration efforts in the Norton Sound tracts. Firms such as Sohio that are engaged in exploration and development of leases awarded in the 1979 joint Federal State Beaufort Sea Oil and Gas Lease Sale face serious and unnessary impediments to the evaluation of the natural resource potential of those tracts.

The problem is caused by the imposition of a stipulation which restricts exploratory drilling for that area to the period November 1 to March 31. The notice of sale stated that the purpose of the seasonal restriction there was to provide additional time for determining whether oil and gas operations pose a threat to endangered marine fauna. We as an operator in that area, would like to submit that oil and gas operations there have not posed a threat to marine fauna, endangered or otherwise.

The imposition of seasonal restricitons on exploratory drilling is the greatest hinderance to the expeditious discovery and development of new energy sources from Alsska. Seasonal restricitons result in the underutilization of expensive drilling equipment, skilled drilling personnel, increased costs, delays the prospect of discovery, hence, ultimate production.

There is an implication in the DEIS that industry does not have the technology to drill in the winter in Norton Sound. Offshore drilling from gravel islands is proven technology in the Alaskan and Canadian Beaufort Sea. We also feel that if seasonal drilling restrictions on exploration are incorporated into lease stipulations there is a real prospect that similar restrictions would be imposed on development, drilling, and production. If this were to happen, it is economically questionable whether oil and gas production will ever be realized, not only from Norton Sound, but from other areas of the Bering Sea as well.

Reading through section III of the Draft Environmental Impact Statement, one can often wonder why little mention of any positive economic impact is made regarding petroleum development on Norton Sound Communities. While forecasting economic impact is always difficult and particularly so before a lease sale is even held, there is a good deal of experience in other parts of Alaska with potential positive economic impacts that petroleum activity can have. For example, the Kenai Peninsula, south of Anchorage, has built a strong economic base around oil and gas production and processing. North Slope development has had a positive impact for those communities with increased levels of employment for local villages and contracted services of regional and village native corporations. During the exploration phase on Norton Sound leases there would likely be little economic impact to those areas except some possible increase in marine support activity of offshore exploration vessels. These activities could take place from existing transportation centers in the area such as Nome or Unalakleet. Assuming discoveries are made in the years following the sale, engineering and environmental studies for development and transportation would begin.

When development activity begins there will likely be increased economic impact in the existing transportation centers as use of local marine carriers and air taxi operations increase. As local demands for warehouse space, supplies and local purchasing in the communities picks up, employment will pick up as a spinnoff of these support activities. It must be pointed out that a subsistence economy is not independent from a cash economy. The DEIS improperly makes the assumption that a subsistence economy today is completely self supporting which is wrong. This implication throughout the section socioeconomic factors distorts impact predictions.

The boom/bust scenario for Nome exxagerates potential social impacts. The DEIS does not qualify the boom and bust projections in terms of realistic probabilities, nor does it consider the planning and siting decisions that would obviously accompany petroleum development. This is probably due to the unrealistically rapid and compressed exploration and development schedule. Again the impact projections tend to be repetitive, redundant, thereby amplifying the reader's perception of sometimes unlikely adverse impacts. The impacts upon subsistance food resources rarely reflects the conslusion regarding impacts upon biological resources. Also, impacts from oil spills based on conditional probabilities and in worst case situations are unnecessarily emphasized. Finally, the employment estimates, especially those related to the exploratory phase are much too high. In regards to population shifts several of the conclusions are based on undocumented occurences. Implications are that much research has been done in this area, however, little has actually been published.

We realize that social and economic change will occur if petroleum discoveries are made and developed in the Norton Basin. However, we believe that the impact projections which are related to social and economic systems are over-stated and in places are highly speculative and largely unsupported by data. We are concerned that little mention is made of positive social impacts, and that analytical discussions of relevant experience with offshore petroleum development elsewhere is definitely lacking. Also, the use of emotional and nonobjective language is out place in any environmental impact statement.

In regards to the orientation program, we feel it is not sufficiently justified as a required mitigating measure. An orientation program containing the material suggested in the DEIS would have no mitigating effects on the occurence of oil spills. Suggested orientation program requirements in the DEIS include: 1) characteristics of fisheries resources, 2) effects of various materials on larval forms of fish, 3) salmon life history and habitat requirements, 4) importance of demersal fish and 5) the distribution and importance of King Crab and fishing areas. Requiring an employee to sit through a technical program of such broad scope when there is not a clear indication of how this employee can mitigate impacts via this program will lead to animosity for environmental topics in general. In fact it could produce a "reversed" effect that would not be in anyone's best interest. It is also suggested in the DEIS that such a program

would create no "undue economic costs to the lessee." We object to this thinking. Companies must pay their employees full salaries to sit through this program, and must forfeit the employees time at their work location adding to the costs of any effected job. The only purpose for this program that makes any sense is the hope that it would "promote an understanding of, and appreciation for local community values, customs, and lifestyles." We argue that it may facilitate an "understanding" but cannot ensure an "appreciation". In addition, any non-harassment goals of the program could be dealt with more effectivley by company policies such as those currently used at Prudhoe Bay.

Any orietation program cannot mitigate spills. And, any type of mitigating action that an employee would have in the event of a spill has been more than aduquately detailed within existing regulatory requirements for spill prevention, containment, and countermeasures (commonly known as SPCC Plan) and also oil spill response training.

In regards to BLM Technical Paper #1, a supporting document titled "Resources, Developmental Time Frames, and Infrastructure Assumptions and Block Deletion Alternatives for Proposed Federal Lease Sales in the Bering Sea and Norton Sound" several comments are necessary. This document describes the petroleum development scenario upon which the impacts are based in the DEIS. The methods, assumptions, and data base upon which the scenario is formulated need to be questioned. Briefly, this scenario presents an exceedingly optimistic development schedule. For example, first production of oil and gas occurs in year six after the lease sale. A more reasonable estimate would be year eight to ten. Secondly, production of oil and gas peaks in year eight after the sale. This is definitely too early, considering studies that would be necessary to place production systems in service. Third, the first of nine platforms is installed in year three and all platforms are installed by year six. Again, too fast a development is implied. Last, the 172 development production wells are all drilled in five years, which is highly unlikely for even temperate climates.

The net effect of this scenario is to seriously exaggerate the potential impacts both environmental and socioeconomic, by compressing exploration and development activities into a few years. Another problem with the scenario is the assumption of a five year tenure of lease. A high level of exploratory activity is indicated with 35 wells drilled in a period th three years, our of a total 45 wells estimated.

We feel the availability of drilling rigs, wellhead equipment, and support equipment to support such an exploration program cannot be mobilized and effectively carried out in the short time frame proposed.

We also feel the gas production profile indicates production well beyond what is the probable economic limit for an LNG system.

Finally the oil production profile, the peak and decline, is definitely too precipitous - especially if it attempts to represent several fields coming into production at different times. Again, all this unrealistic time compression tends to do is intensify resultant impacts. A thorough review

of the assumptions in this document pertaining to oil and gas exploration scheduling is certainly warrented.

Again, the intent of our comments is to call your attention to certain aspects of the Draft Environmental Impact Statement that probably need further refinement and clarity. We feel in general this Draft Environmental Impact Statement is a quality document. We hope our comments will be construed as definitely constructive for that is as we intend them. Following are the more detailed comments on the few sections we found most disturbing. Thank you for this opportunity to submit written comments.

SPECIFIC COMMENTS

The following are our specific comments on appropriately referenced sections of the Norton Sound DEIS.

Section II, Table II B.1a - 1, between page 11 and 12.

The exploration and development schedule presented in this table is very unrealistic. Despite acknowledgement in the Technical Paper #1 that "developmental time frames generated for previous EIS's have been too optimistic... not realistic and do not adequately consider the engineering difficulties inherent in the exploration of a frontier area" (p.2, para.6, Tehcnical Paper #1), the Norton Sound petroleum development scenario (Table II.B.1a-1), which was provided by the U.S. Geological Survey, is not realistic for those very reasons. Included in this unrealistically optimistic developmental schedule are the following projections:

1) First production (oil and gas) occurs in Year 6 after the lease sale (1.e. 1988).

2) Production (oil and gas) peaks in Year 8 after the sale (i.e. 1990).

3) The first of nine platforms is installed in Year 3 (1985) and all platforms are installed by Year 6 (1988).

4) The 172 development/production wells are all drilled in 5 years.

The net effect of this scenario is to seriously exaggerate the potential impacts (environmental and socioeconomic) by compressing exploration and construction activities into a few years. Further, the development schedule occurs at least two years earlier than would be realistic and does not reflect seasonal constraints on offshore operations due to ice, engineering lead times and probable permitting delays. These factors result (among other things) in an employment pattern with a very rapid increase and very high peak; consequently, any socioeconomic impact projections would indicate a boom-bust cycle accompanied by severe social stress resulting from the influx of workers and concentration into a short period of time the purchase of goods and services. Such impact predictions could not be justified if a more realistic and reasonable exploration and development scenario was used.

Other problems with the scenario presented in Technical Paper #1 include:

1) Five year tenure of leases is assumed, thus a high level of exploratory activity is indicated with 35 wells drilled in a period of three years out of the total of 45 wells. (Five year leases are obviously inappropriate for sales in the Bering Sea.)

2) Assuming that sea ice conditions limit the exploratory season to between four and six months, the ratio of rigs to exploratory wells drilled is rather low. (The authors must have assumed that in some lease areas gravel islands would be appropriate and seasonal restrictions would not be warranted.)

3) Considering the distance from the lease blocks to the Cape Nome area (Assumed terminal site), pipeline mileage constructed is rather long even allowing for oil and gas lines with interties.

4) No reservoir and production assumptions are given (number of fields, sizes, IP rates, etc.).

5) The gas production profile indicates production well beyond what is the probable economic limit of an LNG system.

6) The oil production profile - peak and decline - is rather precipitous especially if it represents several fields coming into production at different times.

It is important that the authors of the DEIS understand the limitations and serious shortcomings of Tech. Paper #1 since they base so many of their impact conclusions on it.

Section III Table IIIA.1 - 1, between page 31 and 32.

It would be appropriate to discuss this table in the text summarizing experience elsewhere (e.g. Cook Inlet, Beaufort Sea) and noting that the production technology will be available from Norton Sound within five years such that additional field data is needed but not critical prior to the lease sale.

Also, offshore terminal technology will be available within five years, not five to ten as indicated ("2" should be changed to "1" on the table, "2" deleted from the technology footnote). This is becuase Dome Petroleum is designing an offshore terminal in the Beaufort which will be in operation by 1986 and several oil companies are currently participating in a study to design an offshore loading terminal at Norton Sound.

Section III.B Social Systems, pages 39-61

There are numerous statements in this section relating to impacts. These should be deleted since this is a baseline description of the existing environment. Such statements belong in Section IV.

Section III.C.1e,f page 61

These paragraphs discuss tidal excursions and Local Wind-Induced Flow.

1) The reference should be cited for the tidal excursion data in paragraph e.

2) There are admitted limitations in the overall understanding of tidal excursions. For example, it is supposed that currents and excursions would be lesser (in magnitude) closer to shore "but there are no current observations at all close inshore." Also, "tidal effects in the distributary channels of the river, including the extent of the subsurface salt wedge or tidal prism, are also unknown."

3) Paragraph f supposedly describes local wind-induced flow. However, the actual content describes summer diurnal sea breezes, including a maximum velocity reference, with no correlation to effects in the "flow". Again, there are admitted limitations in the overall process as stated, "The influence of sea breezes may extend 10 kilometers offshore, but there are no observations near the Yukon River Delta."

4) As described in b and c above, if these processes are not clearly understood and have not been observed, then the following summary from paragraph f should be deleted because there is insuffieient justification for the assumptions made therein:

> "It should be emphasized that the last two physical factors, tidal excursion and local wind-induced flow, may have a big influence on the liklihood that oilspills passing near the delta will become rapidly entrained into the delta, as explained further in Section IV.B2.a".

It seems that there may also be a good probability that one or both of these physical factors would assist in the dispersion, dilution, and weathering of an oilspill, should one occur; and also that the processes involved with tidal excursions may serve to hold the spill offshore in the described "narrow elipses" further enhancing the weathering and spill response opportunities.

Section IIIC.2 page 62

1) The following wording taken from what appears to be a summary statement for the general comments on fish resources is awkward and the three statements make unrelated points.

> "While minor when compared with the fisheries of many other areas of the Bering Sea, the fisheries resources of the Norton Basin, nonetheless, are of major economic importance as well as critical for subsistence use by the local inhabitants. The fisheries are a significant link in the food chain for the dominant marine birds and mammals. Further, these fish are unique in that they occupy the transition zone between sub-arctic and arctic marine communities."

The first sentence should be simplified as follows: "The fisheries resources of the Norton Basin have local economic and subsistence importance." The phrase "Critical for subsistence use by the local inhabitants" is redundant. This simplified sentence can be incorporated into another paragraph.

The second sentence is a general statement which can be applied to any marine ecosystem. This should be specifically elaborated on if it is an important consideration for Norton Sound, i.e. which specific trophic level interactions have been identified. Otherwise, it should be deleted.

The third sentence is interesting, but should be elaborated on. It is really a descriptive statement that could be incorporated into one of the other general paragraphs.

2. "Becasue of expressed concern..." does not indicate who has concerns nor what exactly is the concern.

The last paragraph on the page is wordy and overstated. The first sentence is a run-on which should be broken into two sentences.

The second sentence is redundant: "economically...important to the local economy...provide...cash...income." The sentence should be simplified similar to: "However, the area's commercial fisheries are extremely important to the local economy."

III.C.2.a Page 63-64

The discussion regarding salmon population fluctuations is somewhat confusing. In the next to the last paragraph on Page 63, the description of the Pilgrim River Salmon Lake sockeye salmon run includes the statement:

> "The run is currently at low population levels: The...run has varied considerable in magnitude since 1963, with the 1969 run probably being the smallest."

However, at the bottom of Page 63 is the following:

> "Salmon stocks do not exhibit any apparent cycles as do stocks in more southern areas."

Then at the top of page 64 is:

> "Chum salmon escapements exhibit annual fluctuations. Norton Sound pink salmon do not exhibit significant even/odd year fluctuations as do pink salmon in more southerly latitudes. They do, however, exhibit large annual fluctuations, apparently in response to climatic conditions."

This section should be written more clearly.

Sec. III. D. Pages 75 - 83

This section of the DEIS does not mention any positive economic impact that petroleum development might have on Norton Sound communities.

While forecasting economic impact is always difficult, and particularly so before a lease sale is even held, there is a good deal of experience in other parts of Alaska on the potential positive economic impact that petroleum activity can have.

The Kenai peninsula south of Anchorage has built a strong economic base around oil and gas production and processing. North Slope development has had positive impact for those communities thorough increased levels of employment for local villagers and contracted services of regional and village Native corporations.

During the exploration phase on Norton Sound leases there will likely be little economic impact, except some possible air and marine support activity of offshore exploration vessels. These activities could take place from existing transportation centers in the area, such as Nome or Unalakleet.

If discoveries are made in the years following the sale, engineering and environmental studies of development and transportation will begin. When development activity begins, there will likely be increasing economic impact in the existing transportation centers as use of local marine carriers and air taxi operations increase, as local demand for warehouse, supply and local purchasing in these communities picks up, and as employment picks up as a spinoff of these support activities.

Section III.F.1 Page 96

Overall, this section on the environmental studies program is well written. It would be useful to present more detail in subsection c regarding the oilspill trajectory model. This "excellent, sophisticated model" is the basis for evaluating environmental impacts. As such, it should have been described in more detail.

Figure III.E. 4-1

For the reasons indicated in our comments in Table II.B.1a-1, the development schedule shown here is unrealistically optimistic. Consequently, this figure gives a misleading indication of the time available for CZM planning activities prior to the development phase. The more realistic time frame of eight to ten years from the lease sale to first production, and two to five years before major construction commences, leaves more than adequate time for CZM planning activities.

Section IV.A.1, 2 and 3

See our comments regarding Table II.B.1a-1.

Section IV.A.4 Oilspill Risk Analysis Pages 105-108

1. The Oilspill Risk Analysis presented in the DEIS is based on statistics acquired elsewhere in the OCS and does not take into account any effect of higher standards which one might expect would be applied by industry in the Alaskan OCS. Also, this is especially true for tankers. The DEIS looked at worldwike tanker history. U.S. tanker safety records would more nearly represent probable Alaskan experience. Further, the general improvement in safety and reliability as a result of technology advances since the 1964-1979 data base is not recognized. As a consequence risks are perceived as substantially greater than they probably are.

2. The spill trajectory models are flawed in that they do not consider weathering, evaporation or natural dispersion in the water column which can be expected to greatly reduce the amount of hydrocarbon which reaches a shoreline.

3. Table IV.A.4 b-1 the first column heading should be clarified: "mean Bbls" (?) of what? Reserves? Production rate? Spill size?

4. The trajectory models do not account for any oilspill countermeasures which might be implemented.

5. In spite of these problems, the oilspill section of this DEIS is much more realistic than others we have reviewed, and responsible officials should be commended for their utilization of help from industry experts who contributed to oilspill scenarios in Appendix K.

Section IV.A.7., Page 116, para. 4

Offshore loading terminal technology will be available within the next five years. See our comments on Table III.A.1-1.

Section IV.B.1, Page 124 - 145

The sections dealing with impacts on social systems have several serious deficiencies.

1. Many of the impact projections are purely speculative with no data cited to support the impacts. This is especially true of Section IV.B.1.b, Impacts on Sociocultural Systems. No indication is given of experiences elsewhere on nature of the coexistence of oil and gas development and remote communities, and the applicability of that experience to the conditions in Norton Sound.

2. The relative increase in social problems due to OCS development over the magnitude of existing problems is not indicated and possible increases due to non-OCS causes are not specified.

3. The impact projections which portray a "boom-bust" development cycle appear to be based upon the unrealisitic development scenario presented in Table II.B.1a-1 that indicates rapid development compressed into a few years (See our comments on Table II.B.1a-1). Consequently, the social, cultural and economic impacts are exaggerated.

4. The sections focus on the adverse impacts of OCS development with little or no reference to beneficial economic impacts. CEQ regulations require that both negative and positive impacts be addressed.

5. The language and tone of some sections, especially the one discussing sociocultural systems in place, is inappropriate. It is sometimes paternalistic and does not reflect well on the moral integrity of either the Native residents or oil workers.

6. This section should clearly reflect that (1) the Cape Nome - Nome area may not necessarily be the site of a major terminal facility, and (2) the oil industry could adopt various enclave strategies based upon the desires of local residents for interaction, employment and business opportunities. Both of these factors are very important with respect to potential social, cultural and economic impacts. For example, at Dome Petroleum's exploration base in Tuktoyaktuk, N.W.T., which employes over 400, entry to the village by oil workers is not generally permitted while at the same time Dome employs over 200 residents of the village in its exploratory operations. Social interactions are minimized and economic benefits maximized. Clearly, both residents and industry have a choice in determining the nature and level of many impacts.

Section IV.B.1,a Page 124

1. The Norton DEIS discusses at great length the impacts of population shifts within or near the lease area. While it is true that an influx of oilfield workers from the lower 48 could impact any village or town, the DEIS assumes that all newcomers to the development area will be non-Native and generally non-Alaskan.

   Phased OCS development can not realistically be compared with the gold rush boom either in nature or magnitude.

2. With respect to impacts on population the text states in paragraph 2, "Thepresent overwhelmingly Eskimo population of the Norton Sound and Yukon Delta region would be reduced to a minority in the Nome-Cape Nome area for the first time since the turn of the century".

   Such a statement implies that no Eskimos or other Native peoples could be expected to be included in the increased local populations. The present population of Nome is approximately 3,000; were this population predominantly Native now, doubling it would not necessarily make Native peoples the minority. Further, with increased Native involvement in business and industry throughout the State, one could expect that Native participation in industrial development in this area would be substantial.

3. Paragraph 3 discusses the likelihood of peoples withdrawing from the area because of development. Residents of a first class city (such as Nome) would not necessarily withdraw as a direct result of growth in the area. These people have already chosen to live in a more densely populated area.

Section IV.B.2.a Page 145-6

1. The first portion of this section describes the impacts of an influx of industry personnel on the Yukon River Delta habitat. The second paragraph states that "initially about 1,000" and "eventually about 3,000" industry personnel may move into the Nome area. There is no qualification as to the time frame in which these increases would occur. The influx occurs gradually over a period of years, and this qualification should be included. Based on these numbers the following paragraph makes two statements:

   "Portions of this group may make infrequent sport hunting and fishing trips to the Yukon River Delta. They could have a relatively large effect on the abundance of biological resources upon which the delta residents are dependent for their subsistence."

   a. The "portion" of the group is not estimated, but in all probability is miniminal, the "possible" hunting and fishing trips are stated as being "infrequent". These considerations do not justify the conclusion of a "relatively large effect on the abundance" of subsistence resources.

   b. The estimates of 1,000 and 3,000 industry personnel are referenced for the Nome area. The Nome area is at least 100 miles across the waters of Norton Sound. It seems highly unlikely that industry personnel in the Nome area for job related purposes would have either the time or the resources to transverse the 100 mile distance across Norton Sound to hunt and fish. Even if this did occur, the impacts would not be noticeable, if indeed there were any. Therefore this entire conclusion that there would be a "large impact" on the abundance of subsistence resources should be deleted, or modified to reflect realistic considerations.

Section IV.B.2.b. Pages 146-47

1. This section discusses the impact of oilspills, starting with paragraph 3, on the Yukon River Delta habitat. Noticeably understated throughout this section are the results of the Oilspill Risk Analysis based upon the previously described "excellent, sophisticated" oilspill trajectory model prepared for Norton Sound wich "incorporates realistic factors such as subsurface circulation and ice movement." (Page 97). The following is the only reference to the results of the Oilspill Risk Analysis:

   "The Oilspill Risk Analysis indicates that the delta coastline has little chance (2%) of being impacted by an oilspill during the life of the project. This low oilspill risk is partly because of the assumed small chance of discovering oil resources that might be accidentally spilled."

   a. This description causes considerable concern because it reflects the lack of understanding of how the Oilspill Risk Analysis was derived. Page 105 describes in great detail the qualification that the number of spills is based on the assumption that oil is discovered. For the proposed lease area, there is a 14% chance of finding commercial quantities of oil. If oil is not discovered (an 86% probability) there are no oilspill risks. Therefore, the second sentence above is incorrect and misleading and should be deleted. The number of spills does not factor in that there is an 86% chance of having no oilspills. The number assumes oil is discovered.

   b. The cited 2% chance of the coastline being impacted by an oilspill if referenced from Appendix J, Table 15 (Page J-12). This generates additional concern regarding the author's understanding of these results. Relevant information from Table 15 is presented below:

   Table 15. --Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (model), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease tracts using onshore transportation scenario.

Seg.	-------Within 3 days-------						-------Within 10 days-------						------Within 30 days------					
	_1000bbls.			_10000bbls.			_1000bbls.			10000bbls.			_1000bbls.			_10000bbls.		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0
3	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
5	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0

n= less than 0.5 percent
Segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.

****

The following comments pertain to Table 15 above:

1) Segments 2-6 cover the entire delta coast. Information for Segment 6 was not in Table 15 because there was less than 0.5 percent probability of one or more contacts wihtin 30 days.

2) Only segments 2,4 and 5 have a 2% probability of one or more spills, but note that this is for the 30 day trajectory and in all three cases, the most likely and expected number of spills is 0.

3) The model does not consider cleanup, dispersion or weathering processes. A 30 day trajectory would allow considerable opportunity for these processes to occur.

4) For all the land segments comprising the Yukon River Delta, both the most likely number of spills (mode) and the expected number of spills (mean) is 0. In fact, the expected number of spills is 0.0 giving significance out to the tenth of one percent place.

2. The third paragraph, last sentence which follows with comments below, is an attemt to distort the facts in favor of making the Yukon River Delta appear to be more vulnerable to oilspills than it is. It is misleading and should be deleted or futher clarified:

   "However, the Yukon River Delta is actually the only land segment with a probability of short-term contact of an oilspill from the proposed lease area, as opposed to development phase pipelines."

   a. This statement sould be supported with appropriate references to the data. It should also be clarified as to whether or not it is meant that the delta is the only land segment with a probability of being impacted during exploration, while the other segments are impacted during development. In other words, what is being contrasted by use of the phrase "as opposed to"? And why is this comparison important or useful?

   b. Assuming the statement is true, the fact remains as stated on Page 108 that "For the proposal and each alternative, none of the land segments within Norton Sound exceeded a low potential risk". Low is defined as being less than an 11% probability. The major potential impact zones are the northern coastal regions and do in fact relate to the development scenarios. But these "major" zones are still of low risk probability. So, if the Yukon River Delta is the only land segment with "a probability" of contact, it is still a very low probability, much lower than for the "major" area of impact, which is still very low.

3. The fourth paragraph discusses a "major factor" influencing spill risk to the delta - nearshore entrainment processes. The entrainment processes are those described in Section III.C.1.e,f on Page 61. Specific comments have been made above regarding the lack of substantiation for the supposed effects of the so-called "entrainment processes". It is therefore inappropriate to make elaborate conclusions that these processes are a "major factor" in oilspill risk to the delta. In fact, from the description of tidal excursions it seems that equally supporting justification exists to conclude that these processes would have a mitigating effect on the oilspill risk. For example, it is stated that, "Tidal circulation serves to increase lateral spread and possibly vertical mixing in the water column due to current-induced turbulence". This is interesting to consider after evaluating the following statements from Page 97:

   "Transport and transformation (weathering) of petroleum-related contaminants are significant considerations in an assessment of potential impacts of OCS developments. ...During transport, contaminants undergo continual physiochemical changes, such as evaporation, flocculation, emulsification, weathering, biodegradation, and decomposition."

   Therefore it is quite probable that "current-induced turbulence" would enhance the physiochemical degradation of the oil and in fact further reduce the oilspill risk to the delta.

   It is also stated on Page 98 that oceanographic studies were used in the development of the oilspill trajectory model. If it is true that the available data on currents and coastal winds have already been factored into the model from which the risk analysis was made, then it is inappropriate for these same measurements to be cited again as a "major factor" further increasing the risk.

   The concept presented in paragraph 4 is subjective, unsubstantiated and should be deleted.

4. Paragraph 5 again elaborates on the nearshore entrainment process. The first sentence states that "...spills that drift within 10 kilometers of the delta during summer may become rapidy entrained in the delta." There is insufficient justification for this conclusion. For example, from Page 61 are taken the following comments:

"The influence of sea breezes may extend 10 kilometers offshore, but there are no observations near the Yukon River Delta."

"Tidal effects in the distributary channels of the river, including the extent of the subsurface salt wedge or tidal prism, are also unknown."

Paragraph 5 also quotes data regarding the probability of a spill entering within 10 kilometers of the delta. What is not made clear to the reader is that the probabilities are based on the assumption that a spill has occured. They do not include the probability of that spill occurring. Also, the numbers quoted, "about 20 percent within 3 days, and about 3 times as high within 10 days" misrepresents the data in Tables 1 and 2. Within 3 days, out of 20 analyzed launch points, only 3 had a greater than 0.5 percent possibility of reaching the area and these possibilities were 1.7 and 17 percent, not 20 percent. Within 10 days, the 12 possibilities were 1,2,5,5,5,6,7,9,,17, 17 and 22; not 3 times 20 percent.

5. Paragraph 6 contains a lengthy discussion regarding how the oil will persist for 5 to 10 years. There is no reference cited for the Coastal Oilspill Vulnerability Index, so the reader does not know what a "class 8" rating means. The entire paragraph contains very little objective information to clearly identify realistic impacts from the very low probability that an oilspill would reach the delta. This section is supposed to quantify impacts which could result from this proposed sale. This paragraph contains unsubstantiated worst case assumptions and carries them to the extreme conclusion that the entire area including the delta, soil, upland marshes will be oil covered and will remain so for 10 years. This should be rewritten to be more objective and realistic in terms of what the impacts will be. This paragraph also implies that there will be virtually no weathering or degradation of the oil. This argument is open to question.

6. Table 15 indicates that there are only 4 out of 5 segments of the Yukon River Delta which would be contacted by a spill within 30 days. No segment would be contacted by a spill even after 30 days (less than 0.5 percent for Segment 6, all trajectories). No segment had greater than 0.5 percent probability of contact within 3 days. Two segments have a 1% probability of contact within 10 days, and 1 segment has a 1%, 3 segments have a 2% probability of contact wihin 30 days. Both the 10 and 30 day trajectories afford considerable time for the oil to undergo substantial physiochemical changes. This process should not be overlooked. Therefore, what oil that might potentially contact only portions of the delta would be somewhat weathered. And the previously described "entrainment processes" may actually enhance the weathering. This results in the possibility of a local impact which would probably be minimumal in terms of the overall populations involved. It is not sufficiently established that storm surges, etc. will transport oil into the high marsh areas and upstream areas. This is very misleading to the reader.

Section IV.B.2.a Page 148

1. Paragraph 2 again discusses storm surges as a "mechanism for tremendous oilspill damage". The suggested development of a storm surge model seems like a useful project. This model should include however, consideration of the oils physiochemcial changes: evaporation, flocculation, emulsification, weathering, biodegradation, and decomposition.

Until such time as a realistic representation of the effects of a storm surge is developed, statements regarding the importance of this process should be limited and qualified.

2. The 4th paragraph references a special mitigating measure which is contained on page 17. This mitigating measure is the result of concern over oilspills to the delta. This is out-of-proportion to the less than 2% probability that a spill will contact a portion of the delta over the life of the project. This 2% probability is derived from the 30 day trajectory. The information presented on page 17 in paragraph 5 under Area of Special Concern is misleading and inaccurate. The 20 percent chance quoted assumes that a spill has occured. It does not include the probability of that spill having occurred. The acutal data contained in Appendix J, Table 1 contains only 3 out of 20 probabilities that are greater than 0.5 percent and they are 1.7 and 17 percent for the 3 day trajectory. Refer to the comments on Section IV.B.2a, Page 146-7 for a detailed discussion of this subject.

Section IV.B.2.a Page 149

The "unavoidable adverse effect" described is that oil may persist in the sediments for up to 10 years and effect fish and birds. Based upon the comments detailed above, this conclusion is not substantiated, does not qualify as an unavoidable adverse effect and should be deleted.

Section IV.B.2.b, Page 149

1. The referenced Table IV.B.2.b-1 should clearly identify the actual chemical being described in the "Type" column for "Impact Potential". In practical application there could be an important distinction between the effects of pure crude and the actual, 30 day weathered petroleum emulsion which would reach the area.

2. The conclusion describes the devastating effect that "large-scale oil pollution of waters important to salmonids" would have and then makes one statement that the risk is low. The conclusion should be more reflective of the actual impacts to be expected on the basis of the Oilspill Risk Analysis, and not be based on chronic, low-level dishcarges.

3. The suggested orientation program to impart to "those personnel working on lease, exploration and development" knowledge of salmon life history and habitat requirement would not mitigate the effects of a 1,000 or 10,000 barrel spill event. An orientation program will not alter the probabilities derived from the Oilspill Risk Analysis. Making this a required mitigating measure is not justified by the contents in this section. This concern would be more appropriately addressed by the development of the site-specific SPCC Plans required by existing law.

4. The second sentence under Cumulative Effects states that "Reduction in populations would be probable only if oil pollution events were large, chronic and occurring when the fish are near shore." If this statement is true, then the Conclusion (commented on in 2 above) should be restated along the same lines noting the low probability of this occurring.

Section IV.B.2.b Page 150

1. The suggested Orientation Program is not justified on the basis of the information on impacts contained in this section. The potential adverse impacts are not that serious and an oilspill is not that likely. Also, the spill events being assessed are for spills greater than 1,000 barrels. Spills of this magnitude are not the result of avoidable operator error which would be mitigated by an orientation program. The statement, "knowledge of the effects of various discharged materials on some larval forms could prevent such occurrence", implies that the impacts being discussed in the text are for deliberate spill events which an operator has allowed to happen. An orientation program is not justified by the contents of this section, and the concern regarding operator "awareness" would be more appropraitely addressed within the required Spill Prevention, Containment and Countermeasure (SPCC) Plans for oil and hazardous substances.

Section IV.B.2.b. Page 152

1. The Unavoidable Adverse Effects should be rewritten. "Unavoidable reduction in salmon populations" has not been previously substantiated. Also, the last sentence is inappropriate and misleading: "Chronic pollution and habitat alteration could effect populations, but only for the estimated 50-year life of the projects...". This implies that: 1) chronic pollution will occur and 2) that it will occur for 40 years. In either case, chronic pollution does not qualify as an "unavoidable" adverse effect.

2. The orientation program to "stress the importance of demersal fish in the Norton Sound ecosystem and how they might be susceptible to oil and gas development activities" is not justified as a mitigating measure by the contents of this section. In fact, on Page 62 it is stated, "Estimates of biomass from other areas in the eastern Bering Sea are as much as 60 times greater than those obtained from this demersal survey". Also, the orientation program would not alter the results of the Oilspill Risk Analysis, hence it would not contribute significantly as a mitigating measure. This argument is further substantiated with the statement that "Natural mortality may mask the impact of an oilspill on the populations, making quantification virtually impossible".

3. The last statement quoted above should be included in the Conclusion section. It is an interesting phenomenon that the majority of described "sensitive" organisms experience extremely high natural mortalities and still manage to support commercial and subsistence exploration as well as maintain their importance in the food chain.

Section IV.B.2.b Page 152

The requirement for an orientation program "appraising personnel of the distribution and importance of this resource and fishing areas" is not justified as a mitigating measure by the contents of this section.

Section IV.B.2.b Page 154

1. Under Cumulative Impacts it is again presented that there are "wide, natural fluctuations in numbers of larval crab" and that "documentation and quantification of additional reductions as a result of oil pollution is not possible." And yet, this species still maintains sufficient population levels to support commercial and subsistence harvests. This does not seem to warrant an orientation program.

2. Most of tbe information presented under Commercial fishing is economic in nature and does not belong in this section, "Impacts on Biological Resources." The only biological concern would be the remote possibility of a reduction in catch. However, this "reduction" for the most important species, Pacific herring, was previously described as "miniscule". Further, the reduction for other commercial species is considered to be indeterminate from the effects of natural mortality, and subsistence and commercial harvesting.

Section IV.B.2.b Page 155

1. The Conclusion is understated and does not accurately reflect the information presented previously.

2. The requirement for an orientation program to "inform personnel of the operational periods and locations of the commercial fisheries" is not justified within this section as a mitigating measure for the impacts on biological resources. Granted, however, there may be non-biological rationale such as socio-economic considerations which this orientation program could potentially mitigate. However, this section does not justify it.

Section IV.B.2.b, Page 156

1. The reference should be cited for the 20 to 50 year recovery time for bird populations.

2. The indirect effect pertaining to the food sources should be elaborated on. As commented on previously, the text contains an indication that some of the food sources for birds may not experience serious effects. Reference tbe comments for Section IV.B.2.b, Page 149. It was also noted on Page 69 that some birds are "adapted to natural changes in food availability by having a long adult life and low reproductive rate these adaptations allow populations to maintian their numbers during years of low food availability which results in partial or complete reproductive failure."

Section IV.B.2.c Page 157

1. The hypothesis presented in paragraph 3 regarding winter spills being released in leads during the spring should be more adequately supported. Also, the third sentence contains two factors which have previously been discussed as not being as major as they are presented here: reduction in forage fish species and associated survival of sea bird populations. First of all, the forage fishes are not shown to be winter spawners in Table IV.B.2.b-1, opposite Page 150. And, even if a large oilspill did occur during spawning, the result is stated on Page 149 as being an indeterminate, but minute, reduction in the total herring biomass." Refer to comments for Section IV.B.2.b Impacts on Fish Resources discussed previously.

The second factor regarding the reproductive success and survival of sea bird populations based upon the availability of food resources was discussed in the DEIS on Page 68, "Sea birds...are adapted to natural changes in food availability by having a long adult life and low reproductive rate. These adaptations allow populations to maintain their numbers during years of low food availability which results in partial or complete reproductive failure." Refer to comments for Section IV.B.2.b discussed previously.

2. The manner in which the oilspill trajectory analysis data is presented in the last paragraph is very confusing and misleading. First of all, the relative risk scale of high, moderate and low potential spill risk was devised to be applied to the unrisked overall probabilities and not the conditional probabilities. This was specified in the Draft EIS on Page 108. Therefore, the less than 11 percent (low), 11-20 percent (moderate), and greater than 20 percent (high) risk scale is inappropriate for evaluating the conditional probabilities and should be deleted from the discussion.

   Secondly, when the unrisked overall probabilities are quoted, the percent probabilities are stated as a range. This is inappropriate. In actuality, each of the two probabilities represent a distinct entity. The lower probability is for a spill of volume greater than 10,000 barrels. The higher probability is for a spill of volume greater than 1,000 barrels, and includes spills of greater than 10,000 barrels. This distinction should be retained in the discussion.

Section IV.B.2.c Page 158

1. The hypothesis in paragraph 2 that hydrocarbons would be incorporated in coastal sediments and "persist for a very long period of time" has not been substantiated within this document. Similarly, the same is true regarding the behavior of winter oilspills under the ice. Since both of these processes are the major mechanisms theorized to account for any serious adverse impacts from oilspills, perhaps they should be more elaborately discussed.

2. The same comments presented in number 2 for Page 157 above also apply here for paragraph 3.

3. The origin of the probabilities presented in paragraph 4 is somewhat confusing. The conditional probabilities found in Appendix J for the 10 day trajectory range from less than 0.5 percent to 22 percent for the 20 points from which a hypothetical spill was launched. If these are the numbers being referenced, then once again the relative risk acale devised for the unrisked overall probabilities has been inappropriately applied to the conditional probabilities. Refer to the detailed comments for Section IV.B.2.c, Page 157, item number 3 above.

4. The statement, "If an oilspill reaches the entrainment (tidal influence) area, the chances of oil reaching the delta are certain," has not been adequately substantiated within this document. Refer to the detailed comments for Section III.C.1.e and f, Page 61, which are included in Appendix I. Similarly, the conclusion in the last sentence regarding the disastrous effects of an oilspill in the intertidal habitat has not been adequately justified. This paragraph references Section IV.B.2.a which in turn references Section III.C.1. for a supposed "discussion" of the entrainment process. The main argument for basing the significant, long-term, adverse delta impacts rests with 2 brief paragraphs (e and f) in Section III.C.1. Refer to the detailed comments on Section III.C.1. contained in Appendix I.

Section IV.B.2.c. Page 159

1. The second and third paragraphs in the Summary again inappropraitely applies the relative risk scale to conditional probabilities. Reference the comments for pages 157-58 above.

2. The third paragraph contains reference to the entrainment process of the intertidal regions and also that a storm surge would severely compund the adverse impacts of an oilspill on the Yukon River Delta. The hypothesis regarding these two phenomena have not been supported adequately within this docuemnt. Reference the comments for Section III.C.1 included in Appendix I and the comments above for Page 146, 148,157 and 158.

3. The last paragraph which continues on Page 159 again inappropriately applies the relative risk scale for unrisked overall probabilites to conditional probabilities. Also, the referenced Table 5 contains 20 probabilites for Segment 30 ranging from less than 0.5 percent to 30 percent. The origin of the probabilities quoted in this section should be explained.

   The last paragraph should also note that the quoted probabilities are conditional and therefore it is inappropriate to apply the relative risk scale to them.

Section IV.B.2.c Page 160

1. In spite of the elaborate discussion in this section involving reference to conditional probabilities, unrisked overall probabilities and predicted disasterous effects of the entrainment process and storm surges on the delta the conclusion is straightforward and represents an objective assessment of the situation. "However, the oilspill risk analysis indicates the probability of this occurring is unlikely. The final oilspill probabilities indicate that significant regional impacts on birds are unlikely from the proposal."

2. The first paragraph under Mitigating Measures containes the first reasonable justification in the entire document for the proposed orientation program, which is that it would "help to minimize human disturbance of nesting birds." However, the need for all personnel to attend such a program is not substantiated. In fact, if a company policy were outlined in a memo regarding concerns for nesting waterfowl, the same result would be achieved. A similar situation happended at Prudhoe Bay regarding employee interactions with arctic foxes.

3. The last paragraph under Mitigating Measures proposes the creation of a Biollogicsl Taak Force. This could potentially be a useful group depending upon who is involved. Induatry ahould be represented and the group should be advisory in nature, rather than establishing requirements or lease and permit atipulations.

Section VI.B.2.c Page 161

1. The third paragraph under Unavoidable Adverse Effects finally mentions a factor which is importsnt in terms of evaluating impacts on the Yukon River Delta: "However, it is unlikely that apills originating from the lease blocks would contaminate a major portion of the Yukon Delta due to dispersion and weathering of oil."

2. The lsst two paragraphs under Unavoidable Adverse Impacts are straightforward and objectively written.

Section IV.B.2.d Impacta on Marine Mammals

1. This entire aection is extremely well written. It is objective in its discusaion of scientific evidence, with clesr identification of the varioua factors involved. Ststementa are adequately qualified and the entire discussion is supported throughout with the references appropristely cited. This section on Marine Mammals aerves sa a model for review of important biological resources and ia exhaustive in its treatment of the subject matter.

2. In the sub-section for Underwater Noise, Page 168, last paragrsph it is stated thst "Holliday, et. al., 1980, concluded that their measured ambient levels in the Prudhoe Bsy area generally agree with those of Malme and Mlawski (1979), although they also recorded (nesr Narwal Island) tones possibly associated with dieael engines st relatively high frequency". First, Holliday et. al.'s measurements do not agree with Malme and Mlawski's which were as much as 20 dB lower than Hollidsy, et. al.'s in the 1-10 kHz band. Second, there is no way that noise from a diesel engine would propagate through the land-wster interface to the distsnce where Holliday, et. al. measured it. High frequency noise would have been attenuated below the ambient level within a mile of the source. In fact, Malme and Mlawski found that all rig (located on gravel and natural ialsnds) noise components sbove 1 kHz were attenuated below the smbient or system noise floor beyond 1/2 mile from the rig.

3. There sre several complicating factors when conducting underwater acoustic measurements in the arctic. If theae factors are not accomodated for, the measurements sre subject to considerable sources of error. The literature cited in the Underwater Noise aection should be reviewed more closely taking these items into account.

Section IV.B.2.e Impacta on Endangered Speciea

In general, this section is very well written. The only criticism pertains to the statement on page 184: "As discussed sbove, certain types of underwater noise may travel hundreds of miles before weakening." This statement should be qualified as to whst the "certain typea" sre. The noiae traveling that far may be at a frequency that the receiving snimal is unsbIe to detect. Or, if high frequencies are believed to result in physical damage snd stress, it is important to state that high frequency noise would be rspidly attenuated along its transmission path.

A discussion elsborsting on the conaiderstions involving underwater noise utilizing the source-path-receiver model would provide s better perspective and facilitate better understsnding of the complex subject.

III.C.2.c Page 64

1. The first sentence should have the words "the distribution of" inserted between "Information about" and "crab populations."

2. The second and third sentences are confusing as to what is meant by "...a region where many epifaunal species have highest biomass values... Therefore, it is safe to assume that this region which yields king crab in commercial quantities and lsrge concentrations of other invertebrates, is a richly productive region of Norton Sound."

   It seems as though the srea is assumed to be highly productive, because it is highly productive. Perhapa it makes more sense to say, "the area is considered to be highly productive because of the presence of commercial quantities of king crab and large concentrations of other invertebrates."

III.C.2.c Page 64

The next to the last paragraph should have the words "we can assume" delted and replaced by "there is a possibility". Since salmon do not behave exactly as their more southernly counterparts, and since this is a declared "unique" transition area between arctic and sub-arctic marine communities, the possibility of similar patterns should be acknowledged, but it should not be assumed that they are the same.

The point of the last paragraph on Page 64, continuing on Page 65, is not readily apparent. This paragraph should either be deleted or reworded so that the point is clearly made.

III.C.2.c Page 65

1. The first three full paragraphs are confusing, unsubstantiated and misleading. They sre reprinted below with comments following:

   "The shallow subtidal region (0-20 meters) is presumably extensively used by king crab for spawning, female molting, breeding, feeding, and rearing of young.

   Theae phenomena, are strictly seasonal, occurring from May to July. Rearing of young ia asaumed to occur throughout the year in this shallow region. Occasional observations of grasping king crab pairs have been made in shallow waters by Nstives (further verifying the importance of hteis region). Presumably the entire coastal region from the Yukon Delta along the coast, counterclockwiae to Cape Rodney, can be considered as probable king crab habitat.

   During the ice-covered months, king crabs are harvested on a subsistence basis in areas locsl to villages. Therefore, adult king crabs are thought to inhabit the inshore as well ss the offshore regions of the Sound in winter months."

a. The first paragraph containing only one sentence should be incorporated into the next paragraph. The phrase "presumably extensively uaed" ahould be deleted. "Thought to be" or "believed to be uaed" or "a potential area for" should be uaed instead.

b. The second paragraph does not identify which phenomena are "strictly seasonal, occurring from May to July." Obviously, it is not the phenomena listed in the first parragraph because rearing of you ia "assumed to occur through out the year". And the third paragraph mentions that the crabs "Are thought to inhabit" the area during the winter. Alao, feeding would not seem to be a "strictly seaaonal phenomenon."

c. The seond paragraph contains several qualifying phrases auch aa "asaumed to occur", "occasional observationa...by Natives", "Presumably", "probable". Apparently there is not any scientific documentation and the conclusiona are therefore based on indirect and anecdotal evidence. Thia ahould be so stated. It does not seem that "occaaional observations" are sufficient enough for "further verifying" indicates that sufficient verification has already been eatablished. This ia questionable baaed upon the contents of this section.

d. The second paragraph, last sentence sould delete the phrase "along the coaat" it is redundant.

e. The third paragraph describes the indirect evidence that king craba may stay inshore during the winter months since they are harvested locally for subaistence. this contradicts the assumptions made earlier regarding seasonal migrations.

Without scientific evidence to support these statements, perhapa the section should be rewritten to be more objective.

Section III.C.2.d Page 65

1. "Demrsal fish...are utilized by aeveral groupa at different times of the year." "Utilized by several groupa" should be clarified. Perhaps this first sentence is more appropriate to introduce the second paragraph. It seems out of place in the first paragraph.

2. The second paragraph is choppy and not very well organizdd. The following aimplifications are suggested:

> "Saffron cod ia subsistence harvested during winter montha while starry flounder is subsistence harvested during spring and summer months. Marine mammala feed on saffron cod from apring through fall and on arctic cod during the winter. Birda, seals and aalmon feed on sand lance during the spring and summer."

Then the sentence described in a. above makes sense aa a topic aentence for this paragraph.

3. The third paragraph containa the following statement which is confusing:

> "Inner Norton Sound...ia of lesaer importance to demersal fish distribution...than waters weat...which are apparently of low importance."

Doea this mean that the inner waters are even leaa important than outer waters which are considered of low importance?

4. In general, thia section on Other Species is well written. Where there is missing scientific evidence, it is appropriately noted. Unsupported statements and aasumptiona are not made. It is clearly noted when a statement is based upon indirect evidence or auggested by information from other areas.

Section III.C.3 Page 67

The bird section is very well written. The information ia presented clearly and objectively.

Section III.C.4 Page 71

The marine mammals aection is very well written. The referenced Alaska OCS Technical Paper No. 5 ia also very well written and informative.

Section III.C.5 Page 73

We support the reasonable approach preaented in thia section on terrestrial mammala. In thia one small paragraph are "borad-brush" concepta which should be appliea once the ommitment ia made to explore, produce and develop the petroleum resourcea. For example, it is acknowledged that oil spilla reaching the land may have a "local effect" on terreatrial mamals. The effect however, would be "inaignificant to the populationa." Also, disturbance from onshore facilities may cause some local diaplacement, but would "probably be insignificant" in terma of the overall populations. These typea of "bottom line" population effecta are a reasonable way to evaluate development impacta.

Section IVI.C.6 Page 73

Firat paragraph, firat sentence: should delte "non-endangered" and include "endangered" since this section pertains to endangered speciea. This aection ia well written.

TEXACO
PETROLEUM PRODUCTS

TEXACO INC.
P. O. BOX 4-1579
ANCHORAGE, ALASKA 99509

October 16, 1981

COMMENTS BY TEXACO U.S.A.
ON
ORAFT ENVIRONMENTAL IMPACT STATEMENT
NORTON SOUNO OCS OIL & GAS LEASE SALE #57

The following detailed comments are supplementary to the general statement made by Oonald C. Hartman at the Anchorage public hearing on October 8, 1981.

1. Table II.B.1.a-1, facing page 12; Figure III.E.4.-1, facing page 91; and Section IV.A.1 on page 101; all postulate an exploration and development schedule which is accelerated beyond all reason. It is truly incredible to expect an exploratory rig to drill three wells in one year, and equally incredible to have nine platforms installed after six years. A much more realistic schedule would be possibly two wells per exploratory rig per year, and at least six to eight years for the installation of the first platform. The much compressed schedule in the OEIS scenario severely overstates the resultant impacts, especially the impossibly fast development program, so that there is apparently no time to prepare for impacts. If a realistic scenario is chosen, with eight to ten years before full development is under way, then there is quite ample time for thorough coastal zone planning and preparation for impacts.

2. Section B.1.c, page 16: The proposed seasonal exploratory drilling restriction for protection of marine mammals is unnecessary, and would serve only to balloon exploratory costs in Norton Sound. The risk of an oil blowout during exploratory drilling is virtually non-existent, as shown by experience in all OCS waters of the U. S. Furthermore, the OEIS fails to document the susceptibility of marine mammals to spilled oil. Literature cited indicates a very minimum effect, if any, of recorded oil spills on these creatures.

3. Section III.F.1.b, entitled "Geologic Hazards," on page 97, states that "in Alaska, these problems are unique in terms of severity and complexity." As a geologist with 21 years of experience in Alaska in the field, the office, and at the wellsite, I strongly disagree with this assertion.

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There is no documentation anywhere in the text of the OEIS or elsewhere that supports this statement, and we believe it should be deleted.

4. Section IV.8.2.b addresses impacts on fish resources. Somewhere in the introductory statement it should be noted that the fishing and petroleum industries have been living together in the Gulf of Mexico for more than 30 years, and very compatibly. It is widely recognized that, if anything, the presence of offshore facilities enhances fish habitat. In upper Cook Inlet, the fishing and petroleum industries have also coexisted very compatibly for more than 14 years, and records indicate an overall increase in the salmon harvest. On page 150, under "Cumulative Effects," there is a serious contradiction. It is stated that "Chronic oil pollution occurring over a period of years...could reduce (herring) populations. This reduction, however, would have to entail large oilspills, occurring within a relatively short time period..." One of these conditions seems to preclude the other. Chronic spills are mentioned repeatedly throughout this section. Oil is not spilled chronically in the OCS environment. This is strictly illegal, unnecessary, and most undesirable, as much for the oil industry as for everyone else.

Donald C. Hartman

Oonald C. Hartman
Advanced Exploration Land Representative

TEXACO U.S.A., P.O. Box 4-1579
Anchorage, AK 99509

Tanana Chiefs Conference, Inc.

Doyon Building
201 First Avenue
Fairbanks, Alaska 99701
Phone (907) 452-8251

October 12, 1981

Alaska Outer Continental Shelf Office
PO Box 1159
Anchorage, Alaska 99510

RE: Comments on DEIS for OCS Sale 57, Norton Sound

To Whom This Concerns:

Enclosed please find our written comments on the DEIS for Sale 57. These comments supplement our verbal comments presented at the Anchorage hearing October 8, 1981.

Sincerely,

TANANA CHIEFS CONFERENCE, INC.

Jim Kowalsky, Director
Wildlife and Parks

JK/3815a
enclosure

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Statment of the Tanana Chiefs Conference, 320 Second Avenue, Fairbanks, Ak 99701, phone 452-8251, on the Draft Environmental Impact Statement for the Norton Sound Proposed OCS Sale 57, Anchorage, Ak., October 8, 1981.

* * * * * * * * * * * * * * * *

My name is Jim Kowalsky. I represent the Tanana Chiefs Conference as Director of Wildlife and Parks. The Tanana Chiefs Conference is a nonprofit regional Native Corporation serving the interests of 43 rural communities of Interior Alaska. Our boundaries are the same as those of the Doyon Regional Native profit corporation.

Much of the Yukon River and its major tributaries such as the Koyukuk and Tanana Rivers, flow through our region. Most of the 43 Native communities we serve are located on these rivers. The principal reason for this location and continuing existence of these communities is the subsistence and commercial salmon fishery. Any possible threat to the health and productivity of the Yukon River salmon fishery is viewed with great alarm.

The proposed federal oil and gas lease sale 57 in the Norton Sound is exactly that - a real threat - and we do view it with great alarm.

Although offshore and near shore oil and gas impacts are seen in the DEIS as a major concern of only coastal communities, this OCS development could adversely impact the Yukon River salmon fishery of Interior Alaska and it is therefore of great concern to us within our landlocked region.

To give an idea of the importance of this salmon fishery to our region, I brought along the commercial salmon harvest data for the years 1980 and 1981 for the Yukon River and tributories.

In 1980, the commercial king salmon harvest on the Yukon River and its tributaries within the TCC region was 14,600 and 12,700 in 1981. The commercial summer and fall chum catch was 467,100 in 1980, and 461,200 in 1981.

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The 1980 subsistence catch for king salmon within the TCC region (Holy Cross upriver to the Canadian Border) is 33,700 kings and 408,200 chums with a few cohos included.

Incidentally, 13,500 kings were harvested for subsistence use on the Yukon River in Canada in 1980, and 14,500 chums were harvested there in Canada in 1980. 1981 figures were not yet available.

Subsistence salmon harvested on the Yukon River system is not only utilized by the river's residents. Utilization of subsistence salmon goes beyond the immediate rivers. Families frequently barter or exchange fish for other subsistence commodities.

For example, Fort Yukon families may take a subsistence-caught king salmon or two with them on a visit to relatives who live north in the communities of Chalkyitsik, Venetie or Arctic Village where such fish cannot be harvested, and return later to Fort Yukon with caribou meat which generally is not available for harvest in the Fort Yukon area.

Truly, the Yukon River subsistence-caught salmon is a regional resource, tradltionally exchanged with relatives who live on the upper reaches of tributaries where salmon from the rivers are unavailable.

By this method of exchange, it can be readily seen that the salmon resource which could be affected by Norton Sound sale 57 of the western coast of Alaska can affect subsistence throughout the entire Interior.

The basic economy of most of these communities is subsistenced-based with some mix of cash as well, more within some communities than in others. In most cases, the families which make up these small rural communities do rely upon the subsistence harvest. If these salmon aren't available for some reason - such as damage to the fish stocks which would be caused by improper, damaging oil field development and operation within the paths of smolt or adult salmon as they leave the mouth of the Yukon River or return to it - there would be little reason for these families to remain in these communities, and little reason for the communities to exist.

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There is a very substantial reliance upon the subsistence fisheries of the Yukon River and its tributaries. We fear for the impacts of this proposed oilfield development in the Norton Sound upon this fishery resource. The DEIS details something of the commercial fishery of the Yukon River, but not the subsistence fishery, and subsistence appears to be dealt with almost totally within the context of coastal villages. This is a gap in the DEIS to which we object.

Page 150 of the DEIS suggests resultant impacts to smolt salmon could be adverse, and that "certain runs could be reduced or even eliminated," . . ."chronic pollution and habitat alternation could affect populations--for the estimated 40-year life of the projects--."

We are concerned that although the DEIS suggests runs could be eliminated, nobody knows about the distribution of smolt in the Norton Sound, and how long they are present.

Should there be a spring oil spill, for example, when the smolt are coming out the Yukon River into the Norton Sound, it is possible that no food sources would be available for them. There is no information about where the smolt feed when they leave the Delta. This information should be developed and incorporated into any planned OCS development before the development proceeds. What we conclude from this lack of information about timing, location and feeding habits of salmon smolts which leave the Yukon River for the high seas is that an oil spill at an inappropriate time could seriously deplete the salmon resource for years to come for subsistence and commercial users along the Yukon River and its tributaries. This could literally destroy the economic base for Interior villages in the TCC region.

This possibility, compounded by the fact that the DEIS does not recognize the extensive dependence and use of the salmon fishery for subsistence use by communities on the Yukon River drainage within Interior Alaska, forces us to express an utter lack of confidence in

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the DEIS and in the planning process which accompanies it.

Until these information gaps are filled with good data derived from careful studies and with stipulations and negotiating measures designed based upon this missing information, the TCC cannot support federal ease sale 57 for the Norton Sound.

The TCC supports Alternative III, to delay the sale so long as to provide enough time needed to accomplish the research needed to fill the information gaps noted here regarding smolt and adult salmon.

WHALE CENTER

October 10, 1981

U.S. Department of the Interior
Bureau of Land Management
Alaska OCS Office
P.O. Box 1159
Anchorage, Ak 99510

Alaska OCS Office:

The following comments regarding the Norton Sound DEIS OCS Proposed Oil and Gas Lease Sale #57 are submitted on behalf of the Whale Center, a conservation organization reaching 6000 people nationwide. Our review of the DEIS determined that an extensive literature review had been undertaken in preparing this document. We commend the BLM for this aspect of the draft. However, because of limited information on the biological and ecological aspects of the Norton Sound Basin and, for that matter, for the entire Alaskan OCS, we believe that there are a number of inconsistencies and unjustifiable assumptions and conclusions made regarding the impacts of the proposed oil and gas lease sale. We will try to bring those we feel are the most critical to your attention in the remainder of this critique.

The Whale Center is keenly aware of the demands of the nation for a more reliable, domestic source of oil and gas. We are not opposed to the development of OCS resources if a reasonable balance between the national interest for energy resources and those for air and water quality, marine and estuarine biological resources, endangered and threatened species, sport and commercial fishing, coastal land development, marine and shoreline recreation, and visual aesthetics can be attained. Because the information and skills needed to conceptualize the implications of OCS activity in the arctic environment are just beginning to be realized, the Center believes that a

(415) 654-6621 ~ 3929 Piedmont Avenue, Oakland, California 94611

delay in the sale (Alternative III) for a minimum of five years is essential. We concur with the position taken by the State of Alaska that postponement of the sale should extend until such time aa 1) proven technology for low-risk petroleum development and oil spill clean-up is available; 2) adequate measures for protecting the Yukon Delta area become available; 3) onshore infrastructure problems can be evaluated, planned for, and made available; 4) local coastal management plans are completed; 5) progress and transportation methods and measurements are designed to mitigate potential adverse impacts; and 6) more information is available on the effects of petroleum exploration and development on natural resources, so as to allow more realistic and accurate impact assessments. Without this delay, the proposed lease sale could directly conflict with legal mandates under the Outer Continental Lands Act Amendments of 1978, Endangered Species Act of 1973, Marine Mammal Protection Act of 1972, and international treaties on migratory birds.

Characteristics of the Norton Sound Basin

There are a number of reasons for believing that substantial environmental impacts may result from OCS operations in Alaska. Hershman and Feldmann (1978) offered the following list: 1) extensive petroleum operations are to be conducted in pristine but hostile environments, 2) proposed and planned drilling sites are adjacent to some of the world's most productive and valuable fisheries and abundant bird and wildlife resources, and 3) onshore support operations are to be located along sparsely settled coastal regions where even moderate increaaes in population will tend to overwhelm the present community services and lifestyles. The DEIS indicates that these problems will occur in the proposed Norton Sound lease area.

Despite the difficulty of predicting OCS impacts for this pristine, arctic environment, it is highly likely that the nature of the environment will serve to amplify any negative effects.

> "...Because life systems are operating closer to their existence thresholds, are more finely tuned to the environment, and they have less resilience and leeway for error... changes reverberate through the arctic ecosystem more directly and with greater force, because of their simplicity and because of the stresses set up and maintained by the extremes of environmental factors they endure" (Willard, 1976).

Some general impacts likely to occur are:
1) environmental resource contamination and/or

destruction by massive and chronic spills;
2) fisheries and wildlife habitat destruction during construction and operation of onshore and nearshore support facilities by such activities as dredging, filling, and effluent release;
3) secondary impacts from housing and infrastructure development to accommodate increased populations;
4) local economy and lifestyle disruption by boom and bust cycle of oil development and production;
5) political and social conflicts between newcomers and established residents over fishing, hunting, forestry, etc.; and
6) cultural impact on natives (Hershman and Feldmann, 1978).

While the DEIS touches on each of these areas, it is least effective in discussing the environmental implications of oil exploration and development, #1 and #2. The draft centers its discuasion on the possible effects of oil spills and overlooks the potential ramifications of chronic exposure to drilling muds, heavy metals, sewage, etc. Because evaluation is already hampered by the current lack of information on oil spill effects in the artic, this oversight severely limits the draft's ability to assess the full range of implications of OCS development in the area. Lessons to be learned from actual experience are therefore, limited and likely sequences of events following a spill can only be inferred by hypothetical occurrences (Weller, 1980). Thus, the impact predictions are based on assumptions, the reasonableness of which is not discussed in the statement and some of which appear questionable. Increasing the accuracy of these predictions is essential for insuring that the ecological values of the area are preserved. The federal government has already remarked upon the value of this area through the designation of federal preserves. In the south, the Yukon River Delta is part of the Clarence Rhodes National Wildlife Range. The northern part of the Seward Peninsula is contained in the Bering Land Bridge National Park. Various coastal ialands, spires, and wildlife rookeries are part of the Alaska Maritime National Wildlife Refuge (DEIS; 92).

The resourcea of the Norton Basin are extremely varied and rich. The fishery resources are of major economic and critical subsistence value to local inhabitants. The fisheries also serve as a significant link in the food chain for marine birds and mammals. Furthermore, the fish represent an unusual assemblage because they occupy the transition zone between subarctic and arctic marine communities (DEIS; 62). At least five million breeding sea birds or 23% of Alaska's nesting population occur in the area and include three of Alaska's ten largest sea bird colony complexes (DEIS; 67). The vast Yukon-Kuskokwim River Delta complex is important habitat for wildlife from all over

the North American continent (DEIS; 59). And, of greatest concern to the Whale Center, is the occurrence of important marine mammal habitats and seasonal distributions of seals, walruses, and whales. Marine mammal coastal habitata under greatest risk of contact with potential oil spills are those of eastern St. Lawrence Island and the Punuk Islands. Degredation of offshore areas immediately west of the proposed sale area could cause substantial adverse effects on major population segments of walruses; bearded and spotted seals; and beluga, gray, and bowhead whales (DEIS; 174).

Fish and Wildlife Resources

Value to Natives

As stated in the DEIS, the native people of the Norton Sound, Bering Strait, and Yukon Delta areas depend for a substantial portion of the family diet on subsistence useage of fish, bird, and marine mammal resources. These resources are also important cultural elements, both as food and as activities around which the family and community life are focused. Seals are a critical source of meat and oil for food. Skin and guts are important materials for clothing and other home uses. Walrus hides are utilized for boats and line, while ivory is crafted and the meat is consumed. Bowhead whaling is a significant cooperative effort with enormous cultural significance for villagers. The natives have eloquently reflected on the impacts of industrialization on their way of life.

> "In no more than a fleeting moment in time, the balance has been torn apart...When the balance, or circle of life as it has been called, is broken, birds and fish and animals begin disappearing from the land. When they are gone, so are the people who depended on them" (DEIS; 47).

The development of the lease sale area is likely to result in competition and conflict between sport and subsistence users of fish and game resources. As the number of both native and OCS employees increases, the pressure on wildlife resources could become significant. Furthermore, there is some question as to the effects of cash inducements for ivory and other wildlife products on the utilization of these resources.

The DEIS assumes that these pressures can be ameliorated by shuttling the work force to areas outside Nome (DEIS; 22) and through orientation programs (DEIS; 136). The concept of a commuting work force has some appeal, but has not been critically analyzed, especially from an economic standpoint. What are the costs of shuttling workers from Nome to their

homes and with providing them food and shelter in these outlying camps? A further variable requiring consideration is the cost of flying workers out of Nome for rest periods. Given the potential oil and gas resources, are these programs justifiable?

The assumption that informing OCS personnel about wildlife resources and their value to the native way of life will help mitigate negative impacts is founded in faith on the good will of the workers toward the natives. Thia assumption fails to evaluate the characteristics of the people who work on OCS projects in the wilderness areas of Alaska. These people are likely to be independent, self-reliant types who are keenly interested in challenging experiences including the experiences gained by hunting and fishing. Negative impacts might be just as likely to result from these orientation programs. Information on the uses and availability of wildlife resources may alert workers to prime exploitation areas. Direct prohibitions and enforcement would be a stronger mitigation method; the effectiveness of which and the costs to be incurred require evaluation.

Invertebrate and Fishery Resources

The invertebrate and fishery resources of the area are important for native subsistence, have commercial value, and serve as food resources for marine birds and mammals. While the DEIS addresses the potential for oil spills and their effects on fishery resources, it fails to discuss the possible impacts of chronic pollution which would place long-term stresses on these resources and indirect affects such as behavioral aberrations, changes in predation rates, and effects on community structure.

Taylor and Karinen (1976) noted that short-term exposures of clams to the water-soluble fraction of crude oil and oil-treated sediments caused few deaths. however, changes in behavioral responses could ultimately affect clam survival in the natural environment. For example, the movement of clams to the sediment surface after an oil spill increases the potential that they are eaten by predators or die from exposure. Broderson et al. (1977) have suggested that becuase of the cold temperature of the water, the larvae of arctic and aubarctic crustaceans are probably more vulnerable to oil pollution because the larval period of development is prolonged and the toxic fractions of oil spilled will be more persistent. The stress of chronic oil pollution may severely impair the already over-harveated fisheries in the southeast Bering Sea. Over 2,000,000 metric tons of fish are removed annually from this area (Hood, 1976).

Bird Resources

The greatest nesting concentrations of waterfowl and shorebirds along the coast of Norton Sound are found in the southern portion of the proposed sale. Important nesting. feeding, and staging areas also occur along the coast of the Seward Peninsula to the north and St. Lawrence Island to the east. Hundreds of thousands of shorebirds and waterfowl seek refuge in these areas. The Yukon-Kuskokwim River Delta serves as the main habitat for 30% of North America's goose population and 100% of North America's emperor and cackling Canada geese and spectacled eiders. As a refuge to over 24 million individuals of waterfowl and shorebirds, any consequences of an oil spill on the delta would be serious, especially as the likelihood of preventing oil from entering the delta area and ability to clean-up oil is low (DEIS; 157). Furthermore, it appears likely that degredation rates of oil spills would be slow and long-term chronic releases of oil would affect many seasons of avian users. This area is also critical habitat for a significant run of king salmon (DEIS; 59).

Effects of illegal hunting; chronic pollution from oils, dredging and drilling muds; and human interferences were not evaluated cumulatively. The well-documented negative impacts of lead poisoning on waterfowl and of hydrocarbon contamination such as PCBs for predatory birds should underscore the need for a more indepth look at other possible impacts from OCS development than simply evalusting spill contamination. Furthermore, while any one aspect may appear minor, in combination the stresses may be additive and of significant importance. This analysis must be conducted to determine OCS implications for local users as well as for national and international interests. Migratory waterfowl are protected by international treaties and thus, the federal government has responsibilities to other nations for the health and well-being of these resources.

Marine Mammals

The DEIS is concerned primarily with describing the distribution of marine mammal populations and assessing the potential for oil spills to negstively impact these populations. In addition, noise disturbance, habitat disruption, and several other direct and indirect affects are mentioned. While the DEIS states that factors associated with oil and gas exploration and development include shoreline alterations; facility siting; dredging and filling; secondary development; disposal of drilling muds, formation and cooling waters; the potential impacts of these are never explored.

Weller (1980) hss pointed out that there are many unknowns

and uncertainties which keep inveatigations from a complete understanding of impacts; this, however, should not be an excuse for not exploring and evaluating the individual and cumulative impacts of these activities on marine mammals. Furthermore, the DEIS narrowly defines "cumulative effects". It deals only with the affects of oil pollution from additional OCS lease sales along the western coast of North America. However, a review of cumulative impacts should also include a review of the potential effects of increased tanker traffic, seismic exploration, gravel island and pipeline construction, fishing vessels, etc.

The effects of oil spills on marine mammal physiology and behavior are poorly understood. Thus, OCS assessments and related planning should be handled conservatively until more is known, especially in instances where important breeding habitat and nursing grounds are involved.

Cetaceans are subject to direct effects from oil pollution by skin contact and fouling of the baleen and their food resources (DEIS; 178). We are particularly concerned with the potentially harmful effects that would result if oil pollution reduced food resources. Migratory, seasonal feeders would then be forced to migrate to their breeding grounds and return north with insufficient stored energy reserves (DEIS; 178). This could seriously affect reproductive potential and be a particularly severe impact on endangered species of whales. Direct and indirect negative impacts on bowhead and gray whale population survival runs contrary to the aims of the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972. Serious review of mitigation alternatives must, therefore, be studied before the lease sale is conducted.

Alternative tract deletions within the DEIS offer little mitigation. Deletion of the northern tracts will provide little or no reduction in negative impacta to marine mammals. Deletion of eastern tracts would not reduce the importsnt impacts to marine life on or around St. Lawrence Island or in the Chirikov Basin. Deletion of the southern tracts would only reduce impacts in the Yukon Delta area. So, from the perspective of cautious, wise resource use, only the alternatives of delaying or not offering the lease sale (Alternatives II and III) will insure the quality of resources until more information is obtained and indepth mitigation assessments are made.

Technology and Oil Spill Potential

Hood (1976) has stated that the behavior of spilled oil in ice and effects of oil on the associated ecosystem are largely unknown. Even with relatively little experience to date, it is certain that problems attendant with the clean-up of oil spill incidents will be complicated by the presence of ice and severe

cold conditions. Even the DEIS admits that oil apill control efforts would be ineffective (DEIS; 175). Current containment technology is only effective in seas with waves of five to six feet or less (DEIS; 112). With coordination centered in Anchorage, responsibilities for clean-up activities will be severely inhibited and reduce effectiveness of procedures. An oil spill contingency program needs to be prepared to outline the coordination and enforcement of the program, the minimum amount of equipment needed and siting of this equipment. This should be available prior to the sale of leases so that potential lessees can determine the economics of these requirements prior to bidding and be certain of their responsibilities once the sale is finalized. Furthermore, rehabilitstion programs were not discussed in the DEIS. The need for and effectiveness of rehabilitation programs must be explored to completely analyze the potential impacts of a spill.

Environmentsl hazards affecting OCS equipment were discussed, but quickly dispatched by the assumption that technology would be available to meet even the most demanding of these problems within five years. Is there a solid basis for msking this assumption? In view of the multiple threats to pipelines from ice forces, faults, current scour, and liquification, it would seem that surmounting all these threats would require extensive work and experimental trials. Because of these hazards and because pipeline useage hinges on the amount of oil and gas discovered, a more critical look at the impacts of tanker trsffic must be made. It has been suggested that with the development of OCS resources in the Norton Sound srea, tanker traffic may reach two to three trips per dsy (Hershman and Feldmann, 1978). As the number of transfers of oil increases, the chances for oil spills snd potential hazards also increase. Chronic pollution from tankers is known to have a more significant environmental impact than pollution resulting from OCS exploration and development platforms. Tankers are responsible for much more oil entering the marine environment than from daily platform sctivities and unexpected blowouts. This issue was not evaluated in the DEIS and will have important implications for oil pollution impact analysis.

Oil spill trajectories were presented but not anslyzed. The accuracy of these projections depend on the time of year and weather and ocean conditions under which these projections were made and under which they are applied. Without some description of the techniques and assumptions, the validity of oil spill trajectories cannot be taken as more than a very general hypothesis. If this is the case, then the information on oil spill impacts on marine snimal populations is even less precise than expected.

Conclusion

Because it is not possible to predict with accuracy the impacts of OCS development on marine mammals and other marine resourcea, the Whale Center believes that the Norton Sound lease sale should be postponed until more precise estimates on impacts can be made, a reasonable oil spill contingency plan can be developed, and expected disturbances can be mitigated. A number of potential environmental impacts need further consideration before the DEIS adequately covers the environmental consequences stemming from OCS development programs in the arctic. The marine resources in Lease Sale 57 have significant value on a local, national, and internstional level; thus, it is extremely important that the DEIS be more precise in its estimates. Inadequate assumptions regarding technological advances, environmental conditions, and exploratory impacts are not conducive to sound decision-making.

Even allowing for high estimates of retrievable oil and gas, these resources will offer no more than 30 days of oil; however, the natural resources of the area have sustained human life for many thousands of yesrs and may become even more important as the need for edible protein increases worldwide. While the longevity of the proposed project is estimated to be only 26 yesrs, the impacts of onshore snd offshore construction will continue beyond this. Because the petroleum resources will remain available for future exploration, the Whale Center believes that the OCS should remain undeveloped until auch time as the socioeconomic and environmental problems of oil and gas development can be reasonably managed for the conservation of the rich and varied biological resources of the Norton Sound Bssin. The cultural, ecological and aesthetic values of the area and the federal statutes pertsining to wise management of these resources clearly require that Lease Sale 57 be postponed until such time as the criteria presented herein can be achieved.

Sincerely,

Pamela Ferris-Olson

Pamela Ferris-Olson
Research Assistant

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830 W. 21st Ave.
Anchorage, Ak 99503
October 4, 1981

Alaska OCS Office
Bureau of Land Management
P.O. Box 1159
Anchorage, AK 99510

Dear Sir/Ms.:

I am concerned about the Norton Sound OCS Lease Sale. I strongly urge you to delay this sale until the oil industry has developed oil spill clean-up technology adequate to deal with the rough conditions of Norton Sound. A delay will also provide time to complete research on the impacts on several endangered species of whales and other animals in the area. Finally, it is essential that the coastal zone management program being developed by the Eskimos and other residents around Norton Sound be completed prior to any industrial development. These plans are an important way of preserving a unique way of life.

Thank you for your consideration.

Sincerely,

Sue Comis
Sue Comis

cc: Governor Jay Hammond

Dear Alas - BLM, Oct 12, 1981

I would like to express my concern over the pending Norton Sound OCS lease sale. I would like to see it postponed, if not cancelled.

Alaska is still a clean and healthy place to live. I see no benefit in giving up our healthy land and sea for the perpetuation of America's dependence on petroleum products when the lasting solution to our energy problems is decentralized, alternative energy and conservation. Alaska need not follow the same detrimental path the rest of the country has.

I am asking and hoping that the BLM will promote postponing the Norton Sound OCS lease sale.

Thank you.
Sincerely,
Wendy Elsler
4707 Cambridge Way
Anchorage, Alaska
99503

Nunam Kitlutsisti
Box 267
Bethel, Alaska 99559
October 9, 1981

Ms. Esther Wunnicke
BLM/OCS Office
620 E. 10th Avenue
Anchorage, Alaska 99501

Re: Comments made by me yesterday at the public hearing in Anchorage on the Draft Environmental Impact Statement, OCS Proposed oil & Gas Lease Sale 57

Dear Esther:

Yesterday, as you are aware, I testified at the public hearing in Anchorage on the Draft Environmental Impact Statement for the OCS proposed oil and gas lease sale 57. Enclosed is a copy of the written testimony which I submitted. During my verbal testimony I at times strayed from the written text, but the written testimony did form the basis for my verbal testimony.

Please expunge from the record all verbal and written comments made by me concerning my criticisms of the way the public hearing in Emmonak on October 6, 1981, was held. The remainder of my testimony, however, should remain a part of the public record. Please share this letter with the members of the hearing panels that were in both Emmonak and Anchorage, as well as your staff. Thank you.

Sincerely,

Kenneth R. Hamm
Kenneth R. Hamm
Special Projects Coorinator

cc: Harold Napoleon

Enclosure

COMMENTS ON THE NORTON SOUND

DRAFT ENVIRONMENTAL IMPACT STATEMENT

OCS PROPOSED OIL & GAS LEASE SALE 57

ANCHORAGE, ALASKA

OCTOBER 8, 1981

SUBMITTED BY: KENNETH R. HAMM
SPECIAL PROJECTS COORDINATOR
NUNAM KITLUTSISTI
BOX 267
BETHEL, ALASKA 99559

My Name is Ken Hamm. I am the Special Projects Coordinator for Nunam Kitlutsisti. Our mailing address is P.O. Box 267, Bethel, Alaska 99559. Nunam Kitlutsisti is the environmental arm of the Association of Village Council Presidents (AVCP), which is the regional nonprofit corporation representing the social, economic, and cultural interests of the Yup'ik Eskimo residents in the 56 villages scattered throughout the Yukon/Kuskokwim delta region. The testimony which I present today will be a very brief summary of the extensive written testimony to be submitted later by AVCP. Generally speaking, we believe that the DEIS contains very, very serious deficiencies--deficiencies which make delay of the lease sale the only logical alternative. Today, I will speak about five weaknesses which we see in the DEIS: the failure to include within the DEIS the alternative favored by AVCP; the assumption that onshore supply and support facilities will occur in Nome; the poor analysis of migratory waterfowl problems; the poor job of describing fisheries issues; and the inadequacies of the proposed mitigating measures.

I. Alternatives.

The DEIS fails to discuss as an alternative to the proposed action the position which has been advocated by AVCP for the past 18 months. AVCP has requested a delay in the Norton Sound lease sale until four prerequisites have been satisfied: 1. needed baseline studies have been completed; 2. the oil industry has developed drilling technology safe for conditions in Norton Sound, and has developed oil spill

and wind driven currents.

Second, given the storm surges, sediment loading, and breakup flooding in the Yukon Delta area, the transport of an oil spill far into the delta lowlands is inevitable. The synthesis meeting recommended a study of the estuarine hydrology of the Yukon distributaries to define the seasonal importance of these phenomena both offshore and upstream, thus providing a strong basis for transportation routing or non-development buffering in the vicinity of the offshore stream channels.

Third, erratic but fairly frequent storm surges can flood the entire Yukon delta region. This phenomenom is presently poorly understood. The synthesis meeting recommended that a conceptual model relating sea level fluctuation around the delta and Norton Sound to the movement of cyclones in the North Pacific and Bering Sea should be developed. A warning system for oil development and transport activities based on this model could substantially reduce the likelihood of serious impacts from OCS development upon the Yukon Delta region.

Not only have these studies, to the best of my knowledge, never been funded, but the DEIS fails to acknowledge even the existence of these data gaps.

Another study needed to be performed, in our opinion, before the lease sale is held concerns the sedimentation process in Norton Sound. Approximately 90% of the sediments emptying in the Northern Bering Sea come from the Yukon River. These sediments form the basis for the entire Norton Sound food chain , yet the DEIS totally ignores the

containment and cleanup technology which will work under the wind, wave, and ice conditions in Norton Sound; 3. the AVCP region has implemented a coastal zone management plan; and 4. the AVCP region has organized a regional government.

Alternative III purports to analyze the potential adverse impacts which might occur if a three year delay were to occur. However, the impacts listed are nearly identical to the impacts analyzed under the proposal except for a three year delay in those impacts. The drafters of the DEIS have obviously not heard a work that AVCP has been saying for the past year and a half: that a delay in the sale would serve to MINIMIZE, not simply delay, the adverse impacts of oil development in Norton Sound.

The DEIS on page 198 states that "(s)ince there are no major data gaps in the assessment information for the Yukon River Delta, delay of the sale simply delays the possible impacts and does not change the assessment, nor resolve the impacts." We disagree. There are numerous studies that need to be done on the Yukon Delta environment, at least three of which are identified in the draft Norton Sound synthesis report! These three data gaps include the following. First, virtually every storm-free afternoon in the open water season a brisk onshore wind develops. Such a wind could move an offshore oil spill onto the Yukon Delta. The synthesis meeting recommended that a program should be funded to verify the persistence, extent, and velocity of these sea breezes. Also, the synthesis meeting recommended that observation programs should operate one or more current meters to assess the importance and extent of nearshore tidal

sedimentation process. Preliminary studies display that these sediments are highly reactive with hydrocarbons. However, numerous questions reamin unanswered. What are the normal flocking patterns of these sediments? Would these flocking patterns change if the sediments were contaminated with hydrocarbons? How might sediments contaminated with hydrocarbons affect the microorganisms which feed upon them and form the basis for the entire food chain? If contaminated by hydrocarbons, might sediments which have settled to the seabottome be resuspended during periods of intense storm activity, thereby recontaminating the water column? What is the rate of microbiological breakdown of the hydrocarbons contaminating sediments? As you can see, much data needs to be gathered with respect to sedimentation if the adverse impacts of an oil spill is to be accurately predicted.

The DEIS also fails to analyze the way the Norton Sound food chain works. No long-term, interdisciplinary study on the Norton Sound food chain has ever been funded.

No study has ever integrated and synthesized the physical oceanographic data from the Norton Sound region with an emphasis on understanding both the time-varying and the average conditions.

The studies I have mentioned are not insignificant data gaps which only insatiable scientists would want to see performed. Rather, these subjects are the most basic and most important geophysical and biological processes which occur in Norton Sound.

We realize that development will not occur until

several years after the lease sale, and that further OCSEAP studies could, in theory, be funded after the lease sale and before development occurs. However, history displays that further OCSEAP study after a lease sale occurs is minimal. We have little hope that this trend will be reversed, given the Reagon administration's preoccupation with budget slashing. In any event, there is no guarantee that the needed studies would in fact be funded. We would be left at the mercy of government bureaucrats who have failed to fund these studies in the past, and will be rushed into funding needed studies on the numerous other OCS lease sales being planned for the future.

The DEIS's discussions of alternatives incorrectly implies on pages 17 and H-7 that the scoping process in Alakanuk at the special AVCP Convention led to the inclusion of the southern block deletion alternative in the DEIS. The convention in fact passed one resolution only with repect to alternatives: the delay which I discussed in some detail earlier. It is true that there was some discussion at the meeting about deletion of some southern tracts, but this discussion was initiated solely by BLM personnel. The DEIS should reflect this fact. Also, we understand that the other Norton Sound area Native organizations all agree with the AVCP position: that a delay in the sale is warranted rather than one of the various tract deletion alternatives. The variously alternatives incorrectly imply that there is a lack of regional solidarity with respect to the Norton Sound OCS issue.

THE NOME DEVELOPMENT ASSUMPTION

The DEIS assumes that the Nome area will be the center for supply and support bases for exploration and development of the Norton Sound tracts, largely ignoring that the location of these bases may be heavily influenced by decisions made with respect to three other levels of potential oil and gas development existing in the Yukon delta region, namely, the State of Alaska's proposed lease sale including the tidal flats around the Yukon Delta; the Calista-AMOCO agreement on Calsita lands around the mouth of the Yukon; and the Department of the Interior's solicitation of oil industry interest for the Yukon Delta National Wildlife Refuge under section 1008 of the Alaska National Interest Lands Conservation Act. If these three areas are explored and/or developed, we believe that supply and support bases would be established somewhere in the vicinity. If this were to occur, we feel that these same facilities would be used to support offshore leasing activity in federal sale #57, as industry would seek to avoid costly duplication of facilities in the Norton Sound region. The cumulative effects which these four lease sales might have on the siting of supply and support facilities is not adequately discussed in the DEIS. Consequently, we feel that the DEIS should also have descibed a development scenario for the Yukon delta region similar to the one described for the Nome region.

MIGRATORY WATERFOWL.

The DEIS correctly points out on page 67 the extreme importance of the Yukon Delta region as a habitat for nesting waterfowl and shorebirds. The waterfowl are

also an important and irreplaceable subsistence harvest resource, particularly in the spring. Furthermore, waterfowl has a much wider international significance. Our nation has entered into treaties with Canada, Mexico, Japan, and the Soviet Union to protect migratory waterfowl. Also, the Russian and Japanese treaties purport to protect waterfowl habitat. Currently, efforts are being made to amend these treaties to legalize spring subsistence hunting.

The policies created by these treaties--protecting the birds and their habitat--is directly contradicted by the proposed action, since the DEIS displays the adverse impacts which an oil spill might have on birds and their habitat. The tension between the competing policies of bird and habitat protection under the treaties and the possible affects of the proposed action needs to be addressed and analyzed in the DEIS. Are the policies behind the treaties overridden by the proposed action? Similarly, the DEIS should discuss how the proposed sale affects the policies created by passage in 1980 of the Alaska National Interest Lands Conservation Act, an Act which created the Yukon Delta National Wildlife Refuge for four purposes, none of which are for oil and gas development, and 3 of which are to preserve fish and wildlife habitat, to allow for the continuation of subsistence uses, and to fulfill the nation's international treaty obligations.

FISHERIES.

The DEIS spends very little time on fisheries, even though they form the basis of the commercial and subsistence economies of all of the villages located in the

Norton Sound region. One glaring deficiency is that a study has never been performed on Yukon salmon smolt after they leave the Yukon River's mouth in the late springtime. Where do these smolt go to? How long do they remain in Norton Sound? What do they feed on there? How might they be adversely affected by oil spills, either by direct poisoning or by contamination of their food source? You learned in Emmonak the extreme importance of salmon to the Yukon River villages. Requests for additional studies on salmon smolt before the lease sale occurs seems to be a reasonable request to me.

There is a general lack of information in the DEIS on the adverse impacts which an oil spill might have on fish, such as herring and capelin, which spawn along the coastline. There is also almost no information in the DEIS about the importance of river fish, such as whitefish and blackfish, to the diets of subsistence users, and the adverse potential impacts which an oil spill might have on those species. Finally, many river spawning areas within the Norton Sound area are close to the shoreline, and the DEIS fails to analyze the adverse impacts which an oil spill might have on the species which spawn there.

MITIGATING MEASURES.

The mitigating measures in the DEIS are inadequate. Among the stipulations we will be recommending in our written comments will be:

1. No dumping of drilling muds in shallow waters of less than ten meters;

2. Reinjection of all formation waters throughout

the entire leasing area;

3. The establishment of a Norton Sound biological task force, containing two local representatives, with full-time staff, and which must hold regular meetings complying with the procedural requirements of the Administrative Procedures Act;

4. The information to lessess described on page 18 of the DEIS, and the information on subsistence activities on page 19 should be included as stipulations which, if violated, would result in revocation of the violator's leases; and

5. a requirement that an extra oil rig, not being used for drilling another exploratory well, be available in case of an uncontrolled blowout to drill a relief well. The presence of such a well should be required because a blowout during the short ice free season in Norton Sound must be capped quickly, before the ice comes, if a winter long oil spill is to be prevented.

I will close my testimony with some observations about the Emmonak hearing. I sat through the 14+ hours of testimony by the villagers in Emmonak, and was very disturbed by the apparent boredom and detachment exhibited by members of the hearing panel. The village elders who testified are experts on ice, storms, wind, and various other natural phenomena occuring in the Yukon delta onshore and offshore regions. However, there was very little interaction between the panel members and the elders. For instance, when the elders were telling about being trapped on ice floes, the panel made little attempt to ask such obvious questions as

"how thick and large was the ice", "in what direction did the ice move", or "how fast did the ice move." The panel seemed uninterested in gathering this very critical information--information known only by village elders speaking from years of experience. Instead, the panel seemed to care only about ploughing through the long list of witnesses in as rapid a fashion as possible. The Yup'ik people do not understand the white man's desire to rapidly gather information, and as a consequence, inportant information can be gathered only through patience and gentle, probing questions of the speaker. I am sorry that you sat through so many hours of testimony without taking full advantage of the experts before you.

Also, cutting off an elder before he or she has finished speaking is viewed in the Yup'ik culture as an act of disrespect; yet village elders were often cut off in the interest of time. This displays an example of the types of inadvertant cultural clashes and tensions which will be created if large numbers of constuction workers invade Western Alaska to work on oil rigs.

One final comment. A critical component of culture is language. I found it most unfortunate that an attempt was made, again in the interest of time, to stop interpreting English comments to Yup'ik. The message to the audience was that you had no time for their language. They also fear that you have no time for their culture or way of life. Thank you.

X X X X

Alakanuk AK 99554
Oct. 8. 1981

Alaska O.C.S. Office
B.L.M. P.O. Box 1159
Anchorage, AK. 99510.

Dear Sirs.

Would like To present my views of Oil & Gas lease #57. I Had presented oral statment in Emmonak. Hearing. on Subsistance Oct. 6.-81. A lot of participants here talked about Ice conditions. & flows. in the imediate area. of the proposed oil lease. and high water & wind the flows. could have unditerminod force. of which could cause possible oil spill, with shallow. waters. on our coast line. such oil spill could create drastic problem. Tide goes in & out in The winter. this could. carry the oil udder ice. & oil could settle with silthy water to the Bottom. of which This could be present. for sometime in the area. And in case this occure the salmon Smolts. coming out from spawning grounds could be killed off. of which. to my understanding. are very sensitive to pollution. And not only salmon smolts, But also other species, also heavily spawn. Herring spawn on coastline. Herring Roe when hatched. floats on the surface. unlike the other species. And this could cause drastic Hardship for our only source of cash economy & Subsistance

And not only salmon will be effected. also Sea mammals, birds, other wildlife, Plants. of which wildlife forage for food. also a lot of plants are used by humans of. the coastal region. because our coastline. is low land, it floods every Summer & winter. if it should be contaminated with oil. food source for humans & wildlife would be destroyed. food source is like a chain some plants & small fish are eaten by wildlife, then humans eat the wild Life. in case of oil spill & damages our environment, it could cause drastic change of culture. to us natives. and also wildlife Altho we ~~recognize~~ recognize the need to improve, our communityn airfields. schools. & other programs. thru. out our great State. from the revenues if oil should ever be found in our region.

And it is our great concern & we urge the federal Goverment. to do further study on the impact. on subsistance, and also urge The Federal Goverment to delay the lease sale.

Sincerely.
Charles Henry SR
Po. Box 16
Alakanuk, AK. 99554

c.c. Nunam Kitutsisti

13 OCT 1981

Dear Judy,

I have enclosed my own personal comments concerning the DEIS for Norton Sound Sale 57. Would you please pass them along to the appropriate person? Thanks.

I also have some more folks who want copies of the DEIS. Could you send them copies (or would waiting for the FEIS for them make more sense?):

Darlene Rinkes, 8ox 1D88, Nome, AK 99762
Sandra & Brian Cosentino, SRA 8ox 35D0-A, Anchorage AK 99502
Marie Dieringer, P.O. 8ox 988, Nome, AK 99762
Coy Ongtowasruk, General Delivery, Wales, AK 99783

I received Vol. II of Ellanna's TR54, and am still waiting hopefully for the backordered Vol. I.

Thanks again for all the help that you and Nancy Hendricks gave me and the Museum on this. I do hope that we can work together again in the future.

Thanks lots.

Yours,
Roy

Roy D. Iutzi Johnson, Director
Carrie M. McLain Memorial Museum and Archives
2DD Front Street
P.O. 8ox 53
Nome, Alaska 99762

443-2566

From Roy D. Iutzi Johnson, 13 OCT 1981

Comment on Norton Sound Draft Environmental Impact Statement
OCS Proposed Oil & Gas Lease Sale 57.

As a professional anthropologist and concerned resident of the Norton Sound region, I have three comments to make concerning the D.E.I.S. and the proposed Lease Sale:

I. Inaccuracies in content and approach concerning archaeological cultural resources;
II. The significance of the Sociocultural impact; and
III. Norton Sound oil development and presidential energy policy.

I. ARCHAEOLOGICAL CULTURAL RESOURCES

In content, Graphic No. 7 which portrays Cultural Resources of the region needs greater research. For example, at least two village sites exist in Sledge Island, a photo of one which is printed opposite p. 145 in the basic text on the ethnohistory of the region, D.J. Ray 1975. Other known sites may also have been omitted.

The approach to archaeological cultural resources taken in the D.E.I.S. is inadequate and antiquated. Cultural resources are "not identified in the scoping process, nor in the assessments, as significant issues for this proposal." (p.83). I strongly disagree, as the proposed Cape Nome facility happens to be in an area showing documented habitation for approximately 4,DDD years, as shown by the work of J. 8ockstoce. The statement (p. 84) that the "predominant types of prehistoric resources found...are...artifacts" is somewhat narrow and out-dated. Many modern archaeologists do not seek artifacts, but rather seek to discover prehistoric subsistence patterns, systems of social and political organization, etc. This approach of listing artifacts may have been satisfactory thirty years ago, but is not generally considered adequate today. It is suggested that archaeological approaches to discovering prehistoric patterns of human-sea mammal interactions, as well as patterns of sociocultural change, in this region of Western Alaska would be of value not only to ivory tower scholars, but also to applied scientists in the fields of game management and social work.

II. SOCIOCULTURAL IMPACT

The results of the Sociocultural Systems Analysis (Ellanna 198D) and as summarized in the D.E.I.S. show clearly that the proposed OCS oil development would benefit a minority in the region, and be of negative social, cultural, economic, and psychological results to the majority. I believe this speaks for itself.

III. PRESIDENTIAL ENERGY POLIGY

The presidential energy policy as I understand it is to
1, decrease U.S. dependance on imported oil,
2, immediately increase U.S. oil production, and
3, become independant of non-renewable sources of energy.
I submit that the proposed OCS oil development in Norton Sound is not the most efficient method of achieving any of these goals.

In the short term, oil development here will not be producing any oil during the exploratory phases. It would be several years until oil in significant quantities would be produced. Were the money, time, and human energy spent instead on developing methods of cheaply producing alternative sources of power (certainly geothermal and wind in this region), we would most definitely decrease our dependance on foreign oil, would not need an increase in U.S. oil production, and would be well on our way to becoming independant of petroleum, which in the time scale of the existance of our species can only be viewed as a non-renewable resource.

In light of the above, I strongly recommend Alternative II-No Sale as the most advantageous option, and Alternative III - Delay the Sale (along with greater research) as the second best option. Thank you.

Sincerely yours,
Roy D. Iutzi Johnson

Roy D. Iutzi Johnson
P.O. 8ox 1537
Nome, AK 99762

Testimony on the Draft EIS for the
proposed Federal Norton Sound Lease Sale #57

Submitted to: U.S. Department of the Interior
Bureau of Land Management
Anchorage, AK

Submitted by: David Marshall
Economic Consultant
Aniak, AK 99557

~~Submitted at: BLM Public Hearings
Emmonak, AK
October 6, 1981~~

Thank you for permitting me to testify. I would appreciate your including this testimony in the record.

My remarks are on two topics. I conclude that the lease-sale should be cancelled, i.e. the No-Sale alternative should be adopted. The reasoning is that the indigenous local population faces the risk that its culture and lifestyle will be destroyed, with no foreseeable economic benefits, while the value of the lease-sale to the U.S. as a whole is negligible.

The potential source of destruction is oil spills: blowouts; tanker spills (whether accidental or deliberate): pipeline spills; terminal spills. Destruction can occur either from large, one-time spills or from low-level chronic spills. Both have physical and chemical effects: coating of the biota causing loss of insulation and smothering; toxic intake by the biota causing disorientation, behavior change, loss of respiration, loss of reproductive ability, possible carcinogenic and mutagenic effects. Even if the biota are not directly affected, the effect on them may be the same via the effect of oil spills on the food chain: phytoplankton, and so on up.

In short, the effect of this proposed lease-sale on the biota is unknown. By constrast, the subsistence and commercial reliance of the indigen ous population on the biota is well documented (A.V.C.P.; Wolfe).

In order to know the effect of oil spills on the local population, seven sets of data are required: the probability of oil spills of various magnitudes; their duration; their trajectory; the amount and pattern of movement of the biota (birds, fish, marine mammals, shellfish, terrestrial animals) in the affected area; their response to smothering, loss of insulation, and ingestion of toxics, at various levels; the extent to which the biota are harvested by the local population; the availability of alternative biota (for example, the same fish species located outside the zone of influence of the spills).

Of these seven sets of data, the draft is inadequate in all seven. For all except the first, the inadequacy can in principle be overcome by the accumulation of more data. For the first-- the probability of oil spills of various magnitudes-- the inadequacy of the analysis in the EIS cannot be overcome by the accumulation of more data: it is a generic inadequacy.

This is for two reasons. First, probabilit ies are based on historical experience elsewhere. This must be so, but is irrelevant: the Bering Sea is not like elsewhere. Second, probabilities by definition imply uncertainty. This too must be so: it is part and parcel of the technique. But this uncertainty is exposed in a major event, such as that that occurred at the Three Mile Island nuclear reactor in Harrisburg, PA. That event was not in any sense forecast,

despite the extensive body of literature on the probability of accidents of various classes in nuclear reactors (for example, Rasmussen). The parallel between oil spills and nuclear reactors is exact.

Although the inadequacy of the other six sets of data can in time be overcome, the EIS is inadequate there also. The spills' duration and trajectory, and amount of the biota, are based on too short a historical period. The response of the biota of the Bering Sea to smothering, loss of insulation, and toxic intake has no historical basis. Documentation on which biota (for example, whence the schools of anadromous fish) are harvested, and the existence of alternative biota is limited.

In view of the almost complete dependence of the local inhabitants on the biota of the Bering Sea, these inadequacies of the EIS lead to the conclusion that the lease-sale should be rejected. We do not know what we are getting into. The EIS cannot tell us. As a resident of the mid-Kuskokwim, I am not immune from the consequences of the lease-sale: I fish Kings and Silvers for strips and freezing, and chums for my dog team. While the salmon of the Yukon are not those of the Kuskokwim, this sale connot be considered in isolation. It must be assessed in the context of the other lease-sales proposed for the Bering Sea, whether Federal or State: their consequences are cumulative.

By contrast with these risks to local population, the benefits are negligible. To the extent that exploration, development, and transportation of the crude is conducted

offshore, or onshore supply bases are established in the form of enclaves, the employment and income consequences for the local population will be negligible. Because much of the coastline is within unorganized boroughs, fees for the use of harbors, or of development revenues from the oil companies (as in the case at the Shetlands) are not on the cards. To the extent that onshore development does occur in the villages, they will pay a high price in terms of homicide, suicide, drunkenness, inter- and intra-family tensions, increases in the price of goods and services.

To offest this, mitigating measures are discussed. Given the potential magnitude of the losses from oil spills, none of them is significant. One mitigating measure menttioned (but not discussed) is that of compensation as in the Fisherman's ContingencyFund. To be sure, a value can be imputed to the commercial or subsistence harvest, and thereby to the value of the harvest foregone or diminished as a result of an oil spill. On that basis, compensation can be made. But if the biota is destroyed, so is the culture. Then, the greater the compensation required, the less relevant it becomes.

The graphics show the subsistence harvesting and distribution of the biota, by type: marine mammals; birds and terristrial mammals; fish and shellfish. By themselves, they constitute a compelling case for the No-Sale Alternative. The reason given for the lease-sale is then the

national need for oil and gas and the need to reduce the nation's reliance on imports from foreign countries, which pose the problems of "interruption" and other "threats".

On need, if we assume that this lease-sale's oil-- 450 million barrels-- were the sole source for the U.S. as a whole, it would last one month. This assumes a national consumption rate of 15 million barrels a day. Further, events since (the OPEC embargo of) 1973 show an increased desire on the part of foreign exporters to arrive at a modus vivendi with the United States. This is in their own interests because the U.S. is the major importer, and revenue from oil exports is their only significant source of foreign exchange. The world price of oil now better reflects their perception of extreme reliance on a nonrenewable resource. If this is accepted, then the argument for this lease-sale must be that Alaskan crude can be produced and sold more cheaply in the U.S. than foreign. Since price controls have been lifted domestically, the U.S. price will rise to the world price. In addition, it appears that this crude might be sold to Japan in exchange for Middle East crude.

None of this is discussed in the EIS, which presents no rationale for the lease-sale except the one-line justification (p.1) which, when analayzed, is unconvincing.

In short, the sale alternatives would have negligible positive effects on the United States as a whole, but

potentially profound adverse effects on a local minority group-- the Eskimos. Conversely, the No-Sale alternative would have negligible adverse effect on the United States, but avoid the potentially profound adverse effects locally.

The Eskimos, and the contiguous Athapaskan Indians, constitute the most homogeneous minority population in the nation. Their ability to wrest a living from the natural resources, the culture and lifestyle they have erected on this, and the integration of their lifestyle with the physical non-renewable resources on which this depends are unique in the nation. This is a priceless part of the national heritage. The proposed lease-sale threatens it with extinction.

I conclude that the No-Sale alternative should be adopted.

-End-

Bibliography

(1) Association of Village Council Presidents. 1974, 1976, 1982 (forthcoming). Subsistence Calendar, Bethel, AK

(2) Wolfe, Robert J., 1979 Food Production in a Western Eskimo population. UCLA Ph.D. Thesis., Los Angeles, CA.

October 20, 1981

Marsha Bennet
OCS - BLM
Anchorage, Alaska

Dear Marsha:

This letter presents the comments on the Norton Sound DEIS that I gave at the public hearing on October 8 (as a private citizen rather than a Subsistence Division employee) in addition to a variety of other comments that I did not include in my formal testimony. My main criticism is that, as was the case with the Habitat Division's draft 1981 report on potential impact of oil development on Norton Sound, the OCS authors had very little subsistence data to work with, and yet the harvest data presented (on maps or in the text) is virtually unqualified. By this failure to delineate the limits of the data, the author s imply that it is much more complete than it is and that it has been verified, which much of it has not. I make this statement with the assumption that the Habitat report was the major resource of specific subsistence harvest area data for this DEIS; the Habitat report has since had several qualifiers attached to its harvest maps. I have not seen the revised Habitat report, but I have been informed that an errata sheet has been included with the maps, identifying several shortcomings of the map harvest data that I brought to their attention. In addition, a statement was added to the maps themselves as follows:

> "The subsistence harvest data presented on this map come from a variety of sources. The data for several villages were gathered from a very small number of informants in an informal manner or from indirect sources only, whereas data for other areas were based on responses from larger samples or extensive formal research. In view of the varying quality of the data presented, it is important that the data be interpreted cautiously, realizing that the extent of subsistence use may be understated."

You may wish to solicit from Denny Kelso a copy of my memo to Lance Trasky of Habitat in which I express my concerns over the shortcomings of the harvest data presented in the Habitat report as well as the lack of appropriate qualifiers.

I do have several specific comments and suggestions regarding this report which I will offer as follows, by page number of the relevant section of the Statement:

page xiii paragraph 5 - It should be emphasized that a delay in the sale would allow additional subsistence-releted data to be gathered. At present the data available is very limited for most of the Norton Sound-Bering Strait region.

page 22 paragraph 4 - Most if not all of the villages from Stebbins to Shishmaref depend to a large extent on Nome for supplies and would therefore be adversely affected by inflation. This paragraph, as well as others similar to it elsewhere in the text, implies that only those villages in the immediate vicinity of Nome would be effected by Nome inflation.

page 40 paragraph 2 - I believe that the authors refer to the traditional population of 1840 to 1880, not 1940 to 1980.

page 40 paragraph 3 - My research in Shaktoolik suggested that caribou hunting areas had not remained static but had shifted further inland in response to the decline of caribou along the coast in the late 1800's.

page 43 paragraph 1 - Only Elim, Nome, and Unalakleet have piped water and sewer systems to a major portion of the houses. Other villages may have bunkers and/or village water tanks. Is this what is meant by water and waste sytems?

page 47 peragraph 4 - The breakdown of villages by ecological orientation as presented corresponds neatly to geographic distribution, but my opinion is that Teller resembles Norton Sound subsistence patterns more than small sea mammal communities such as Shishmaref, in that Teller is more oriented towards fish.

Table III. B. 3.-1(b) (following page 47) - I know that Savoonga often harvests walrus in the winter; this may be true for Gambell as well. The minke whale is often harvested in the summer - in fact, I believe the Savoonga people refer to it as the "summer whale". Ringed seal is important to all villages. I know that it is harvested in the winter and spring and probably in the fall as well. Gambell harvests seals in the summer - I'm not sure what species. Although crab are indeed harvested in the winter, the spring months of March and especially April and sometimes May are the primary harvest months for Savoonga and Gambell. Crab are an important

harvest in Nome and Little Diomede also. (not just Gambell and Savoonga). The best months for Nome and Little Diomede are probably March and April (spring). The large sea mammal hunting pattern is not confined to the Nome sub-community of King Islanders, for there are St. Lawrence, Wales, and Little Diomede sub-communities as well. Wales should also be included on the list. Tomcod are important in the spring to the various sub-communities in Nome. (see attached xerox copy for other changes).

Table III. B. 3.-1(c) - All villages harvest salmon through September and even into October - silvers and chums upriver. Koyuk harvests smelt in the winter. Shaktoolik's smelt harvest is very small, almost nil. Tomcod (saffron) are caught in the fall as soon as there is ice in the rivers (Nome, Koyuk, Shaktoolik, others?). Shaktoolik doesn't harvest flounders that I know of. Greyling and char are caught through the ice in the spring by most or all villages. Very few whitefish are caught by Shaktoolik. Elim and White Mountain are active crabbers in addition to the villages listed. Young bearded seal are caught by all villages in the fall. Spotted seal are caught in small numbers in the spring by Shaktoolik. Ringed seal are caught in the spring as well as the winter by most villages. Nome should be included as a walrus harvester, as I don't believe you can actually distinguish a Nome group separate from the various sub-communities of village origin. Belukha whales are very seldom harvested by residents of Golovin, White Mountain, Council, or Nome. The other villages have an important belukha harvest in the fall. Elim may harvest some ceribou. The season of caribou harvest is December through April, not in the fall. All the villages on the mainland harvest ptarmigan in fall, winter, and spring. As you list ptarmigan in table (e), you probably should do the same for the other tables, excluding St. Lawrence and Diomede. (see attached xeroxed table).

A final note on these tables - The data presented is obviously incomplete and should be qualified and the need for further research emphasized. The data I have added is by no means conclusive and may be inaccurate for some of the communities that I am not so familiar with. As you can see, I am most familiar with the Norton Sound area.

page 48 paragraph 2 - The reference to 800-1000 hair seals harvested in recent years could be interpreted to mean a total for several years together. Rather, it must be an average estimate par year and should be so identified.

page 49 paragraph 5 - Subsistence utilization areas may include 2-3 miles offshore ice (on shore), certainly not 20-30 miles.

page 50 paragraph 1 - The harvest of fall salmon in September and October is an important one - fishing is not restricted to June - August.

page 50 peragraph 2 - Ellanna's diet composition estimates are somewhat high compared to my Shaktoolik study, but as I point out, there are variations between seasons and years which make a specific estimate difficult.

page 50 paragraph 3 - Gill netting and set netting refer to the same gear and method.

Graphic No. 2A Subsistence Harvest of Marine Mammals (following pg. 50) - The bowhead harvest area of Wales should be included; they have only taken one in the last decade (1980), but it is my understanding that a boat continues to hunt every spring for bowhead. There is a serious error for belukha harvest areas in that the entire Norton Bay area from Cape Darby to Egavik is not identified as such. It is my impression that the printers mistakenly used the color green instead of orange, thus showing the area as a walrus harvest area rather than belukha. Also, Diomede hunts belukha and no area is identified. Walrus areas should be identified north of Stebbins and in Golovin Bay, as well as Norton Bay and Besboro Island. Golovin is left off of the map.

Graphic No. 2B Subsistence Harvest of Birds and Terrestrial Mammals - Shaktoolik hunts moose on the Shaktoolik and Ungalik Rivers. The one arrow given for caribou harvest does not adequately point out the areas at the headwaters of the Shaktoolik River and Granite Mountain. Grizzly bears are utilized very rerely except by Golovin and White Mountain (Golovin is not included on the map). The seabird harvest on Little Diomede is not on the map. Most of the egg harvest areas are not identified on the map; the see bird egg areas are identified (cliff eggs) with the one commission of Cape Denbigh, but the seagull and waterfowl egg areas (tundre, islands) are not identified with the possible exception of the Stebbins and Gambell areas. Seagull eggs are gathered from "seagull islands" on the tundra flats all eround Norton Sound, Port Clarence, etc.

Graphic No. 2C Subsistence and Commercial Harvest of Fish and Shellfish - This map appears to have all the shortcomings of the similar maps

in the draft Habitat report. The following rivers have subsistence fisheries not identified on the map:

Ungalik, Inglutalik, Koyuk, Tubutulik, Kwik, Kwiniuk, Kachquik, Feather, Grantley Harbor, and Tuksuk Channel.

Nome and Shaktoolik have commercial salmon fisheries on the coast that are not identified. There is no commercial salmon fishery permitted in Port Clarence, but one appears to be identified there. I am unaware of any crabbing that goes on near Stebbins and St. Michael. Unalakleet goes subsistence crabbing near Egavik. Shaktoolik areaa include Cape Denbigh and Besboro Island. Elim's crab area extends further toward Cape Darby. Diomede is one of the most active crabbing villages (for identification of crabbing areas, see my report to the Board of Fisheries of March 1981, Norton Sound-Bering Strait Subsistence King Crab Fishery). Clams are harvested on the coast at the mouth of the Shaktoolik River.

A final note on the maps - As my comments above indicate, there is a need for the data presented in the maps to be qualified. Perhaps the wording added to the 1981 Habitat maps would be appropriate. It should be noted that even if all of the harvests I have noted were added to the maps, there are many harvests that would still be left out, for I am only aware of part of what is actually taking place. Thorough subsistence mapping has been done for very few areas in this region (for maps of Shaktoolik harvest areas, see my report soon to be released). My main point is that the data as they are currently presented contain no qualifiers, implying that the data are complete and verified, which is obviously not the case.

page 51 paragraph 3 - The wording of the first sentence implies that every village family has a member that is working. On the contrary, usually there are not enough jobs for this to occur. It was my observation in Shaktoolik in 1981 (when seasonal construction has ended) that roughly half of the village households had members with steady jobs. Of these, only half were full-time. In the second sentence, a list of Norton Sound communities that have commercial fishing income should include Shaktoolik, Koyuk, Stebbins, and St. Michael.

Table III. B. 4-6 - Basing an annual average on the figures for the month of October will give a misleading high total, for cash assistance drops to low levels in the summer, to rise again in the fall.

Figure 111. C.1.-1 and -2 (following pg 59) - I believe that these photos must have been reversed, as there is ice in the summer and none in the winter.

Graphic No. 3 (following pg 66) - Arctic char are anadromous and should be indicated as present and spawning in the rivers.

Graphic No. 5A (following pg 72) - Shaktoolik residents speak of occasional years in which spotted seals haul out somewhere in the Bald Head area by Moses Point. The arrow indicating summer feeding movements of belukha should include Norton Bay. The arrow indicating fall migratory movements of belukha does not satisfactorily indicate the migration of belukha south through Norton Bay and along the east coast of Norton Sound in September, October, and November.

page 73 paragraph 3 - (see comments above)

page 77 paragraph 3 - The local commercial take of king crab has been practically nil for three years now (1979-1981)(by local residents).

page 80 paragraph 5 - St. Michael has no local commercial salmon fishery; those individuals with permits have them for the Yukon River. Shaktoolik and Koyuk should be included on this list.

page 3 80 paragraph 6 - The commercial season ends August 31.

page 80 paragraph 9 - The local commercial herring fishery was at a very low level for several years prior to 1978. Purse seines have been illegal in 1980 and 1981.

page 82 paragraph 3 - The large boat fishery in this area has always been concentrated on red king crab off of Nome - the blue king crab harvest around St. Lawrence has been small in comparison.

page 125 paragraph 3 - As a resident of Nome, I strongly dispute the claim that white residents of Nome would welcome a rise in population. This may be true for the business community and the construction industry, but it is not true for a major portion of the government agency people who make up a large percent of Nome's white population and many of whom have come to Nome for its outdoor recreational opportunities (hunting, fishing, enjoyment of wilderness).

page 126 paragraph 2 - Inflation has the potential to greatly impact cultural goals due to the reliance of the subsistence economy on costly equipment and supplies. I would not term the effects of high inflation rates as moderate.

page 131 paragraph entitled "Conclusion" - (see comments for page 126 above)

page 132 paragraph 4 - Table IV. B.1.c.-3 does not adequately address the effect of construction and other activities on the spatial availability of certain resources. In particular, I am thinking of such sensitive species as bowhead whales and belukha, which are ranked as having low-moderate sensitivity to construction. Saint Lawrence and Norton Sound hunters are very aware of the sensitivity of these species to engine noises and would undoubtably disagree with this low ranking. I find it regrettable that transport activity was not included on this list, as that is of major concern regarding potential impact on migration routes, distribution, and nesting activity. In addition, I am surprised that arctic char is given a low rating on harvest pressure, as it is a popular sport fish in the Nome area. Also, I would have thought that it would have an oilspill sensitivity similar to salmon, as it is anadromous and often in the same areas as salmon or grayling, which received a moderate and high rating respectively, compared to a low for char. I am also surprised that smelt rank high in this catagory but saffron cod rank low, for they are often found in the same area together. I don't know the biology involved, so maybe my concern in unwarranted.

page 133 paragraph labeled (3) - Unalakleet and Shaktoolik have had no involvement in a commercial king crab fishery that I have heard of.

page 136 paragraph 2 - I think that the logic here is not valid. Wolfe's Kotlik study showed that increased cash might result in an increased harvest which could be readily shared even if the cash was not (Wolfe 1979).

page 140 paragraph 2 - As I mentioned earlier, most villages from Stebbins to Shishmaref rely to some degree on Nome for supplies and equipment and would therefore be affected by any rise in inflation. This factor should be emphasized along with the potential impact on subsistence resources.

page 140 paragraph 3 - Once again, Koyuk and Shaktoolik should be included in any list of Norton Sound commercial fishing villages.

page 149 paragraph 4 - I don't know how the authors compared the importance of salmon and herring, but salmon is certainly more important as a local food for villages from Nome to Unalakleet.

page 180 paragraph 1 - I have heard one member of the OCS staff make reference to this grey whale study to shirk off the potential impact of boat traffic and other human activity on bowhead whales. To prevent such an abuse of information, I suggest deletion of the words "species such as" in the fourth line so that the data is tied specifically to grey whales and won't be generalized to other species such as bowhead whales.

page 196 paragraph D.1.b. Conclusion - Delaying the sale would allow more time for research and CZM planning which would definitely have the likelihood of reducing the impact. This point should be emphasized here, so that the benefits of the "Delay the Sale" Alternative will be recognized.

Sincerely,

Dan Thomas

Dan Thomas
1772 Scenic Way #1
Anchorage, Alaska 99501

My name is Della Trader and my mailing address is P.O. Box 136 Emmonak, Alaska 99581-9999.

I was born and raised here in Emmonak. I am now 20 years old and still a resident of Emmonak.

When I was a young girl, my uncle Vincent Kassock used to tell me stories of long ago. The people in those days had a hard time hunting the food for their families. They did not have guns as we do today. But when the game was caught, it was shared among the village.

Today we are having the same difficulty. Most families cannot feed their children properly because of high costs in our local stores here in Emmonak. The prices out here are way higher than the prices in Anch or in the other big cities. We don't have have enough money to go down to the store to buy a months supply. Our welfare checks as well as our food stamps have cut because of Reagan.

Because of that, many families are stuck with no jobs. That means no nutrition, no protein and most important of all, no proper meals at on the table. But the men go out to hunt and stay out as long as they can until they have caught enough food to last a while. But that is much cheaper than going to the store where you can get groceries that will last a few days. We have been hunting for many generations. That is how we survived.

Of course you can imagine what will happen if you drill for oil and there is an oil spill. Or do I have to write it down to tell you what will happen? Alright. If you drill for oil and there is an oil spill, many animals and plants will die. But that is not our fault. We did not drill for it. The fish, seals, moose, bears and the animals in that area will die from drinking the contaminated water. So will the other species that come near it. Nothing will survive. Then it will be the people who live around that area.

Jobs are very scarce these days, especially in the bush area. We cannot go out to the big cities to find a good paying job to feed our families and to pay our bills. and credits. During the summer fishing seasons, we use the hard working money we have fished for without two nights of sleep, to feed our families and to pay what is owed. When the fishing season is closed, we do not have enough to last the whole winter. So we have to stretch it out.

If you should happen to drill for the oil, and there is an oil spill, who is going to buy our groceries? What do we have in store for the winter? How are we going to feed our families? How are we going to pay our bills? Will we have our welfare checks and food stamps back? What will we have in the futures to come? These questions are being asked among ourselves since the day we heard of the drilling for oil. It wasn't too long we heard of it. That isn't much time for us. We have waited so long for so many things. Why can't you wait just as we did? Time is what we have to live with. Time is what we need - TIME.

Besides, after the drilling is done, our food is gone, THE GOVERNMENT WILL PROBABLY FORGET THE PEOPLE OUT HERE WHO ARE STRUGGLING TO LIVE!!

We are going through alot of misery today, and we don't want anymore problems to face. Most things we cannot handle ourselves. It is very hard to get outside help, for example - WASHINGTON.

Before you plan on drilling for the oil, THINK FIRST AND REMEMBER the people out here who want to live just like you.

If there isn't anymore subsistence in our area, we will have nothing. Unless we go to your cities to hunt them. But we know very well what will happen. We will

have to go through courts and put in prison - just because we were trying to feed our families.

Please do not take away our only food we can afford by killing them. We too are humans and we have the right to live just like you.

P.O. Box 136
Emmonak, AK 99581
October 9, 1991

President, members, audiences
Alaska OCS Office
Bureau of Land Management
P.O. Box 1159
Anchorage, AK 99510

Dear People:

We had quite a few people to testify here in Emmonak, and every body had a chance to say their part towards exploring oil and sea mammals and fish. On my part I would like to say about people all over the world. As far as we know, we have people all over the whole darn world, that need something for their living. We have people in the whole world that don't have any thing to live by, and therefore we have millions of people starving. Others try to make a living by stealing and killing because they had never won what they fought for. While other people are having fun and enjoy their lives and don't care of other people that have nothing.

I'm scared of both agendas, because they are both concerns of Yukon Delta residents. I'm even scared to talk about them because every time I think about them they really trouble me. Why does it scare me?

Because either ane of us could become number two. Reagan, taking the budget away from next generations who are coming to our world. So therefore we need time to clearly understand this matter. We could say everything will be all right, but we never know what the future is going to look like.

I'm not looking at today's life; I'm trying to look at generation after generation, since we don't know what will happen to us within five minutes.

That is why we need time to consider.

Sincerely,

William Trader

William Trader

WT:btm

The following comments were received after the October 16 deadline and we were unable to reprint them. They may be reviewed at the Alaska OCS Office.

U.S. Department of Commerce
National Oceanic and Atmospheric Adminstration

U.S. Department of Interior
Bureau of Indian Affairs

U.S. Department of Transportation
U.S. Coast Guard

Federal Regulatory Commission

Marine Mammal Commission

State of Alaska
Department of Transportation and Public Facilities

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ACRONYM GLOSSARY

AALRS	Alaska Automated Land Records System
ABSORB	Alaska Beaufort Sea Oilspill Response Body
ACMP	Alaska Coastal Management Program
ACORP	Alaska Cooperative Oilspill Response Planning Committee
AEIDC	Arctic Environmental Information and Data Center
ADF&G	Alaska Department of Fish and Game
AMSP	Areas Meriting Special Attention
ANCSA	Alaska Native Claims Settlement Act
AOGA	Alaska Oil and Gas Association
AS	Alaska Statute
AVCP	Association of Village Council Presidents, Inc.
BAST	Best Available and Safest Technology
bbls	barrels
Bcf	billion cubic feet
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BPTCA	Best Practical Control Technology Currently Available
BSNC	Bering Strait Native Corporation
CETA	Comprehensive Employment and Training Act
CEQ	Council on Environmental Quality
cf	cubic feet
CFR	Code of Federal Regulations
CMP	Coastal Management Program
COE	Corps of Engineers
CRSA	Coastal Resource Service Area
CZMA	Coastal Zone Management Act

DCM	Deputy Conservation Manager
DEC	Department of Environment Conservation
DEIS	draft environmental impact statement
DOC	Department of Commerce
DOE	Department of Energy
DOI	Department of Interior
DOJ	Department of Justice
DOT	Department of Transportation
DPDP	State of Alaska Division of Policy and Development Planning
EA	Environmental Assessment
EDA	Economic Development Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
EWC	Eskimo Whaling Commission
FAA	Federal Aviation Administration
FEIS	final environmental impact statement
FERC	Federal Energy Regulatory Commission
FR	Federal Register
ft	foot
FWS	Fish and Wildlife Service
HCRS	Heritage Conservation and Recreation Service
HUD	Department of Housing and Urban Development
IPP	Intergovernmental Planning Program
lbs	pounds
LNG	liquified natural gas
mi	mile
MMPA	Marine Mammal Protection Act

MMbbls	million barrels
MMcf	million cubic feet
MOU	Memorandum of understanding
NEPA	National Environmental Policy Act
NGPA	Natural Gas Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
OCS	Outer Continental Shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OSC	On Scene Coordinator
RDA	Rural Development Assistance
RRT	Regional Response Team
SESP	socioeconomic studies program
SID	Secretarial Issue Document
SSC	Scientific Support Coordinator
Stat	Statute
TAPS	Trans-Alaska Pipeline System
tcf	trillion cubic feet
TMP	Transportation Management Plan
USCG	United States Coast Guard
USGS	United States Geological Survey
WAATS	Western Alaska and Arctic Transportation Study
Y-K CRSA	Yukon-Kuskokwim Coastal Resource Service Area Program
YKHC	Yukon-Kuskokwim Health Corporation

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